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POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

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SEE PAGE 680



MALASE



Luckies



They Taste Better

HOW SCIENCE MAKES CARS LAST LONGER TODAY



Big New Plymouth a Supreme Example

WHEN YOU MASTER heat and vibration in an automobile, you have a car that will "stand up" . . . a car that will always be dependable . . . a car that will last.

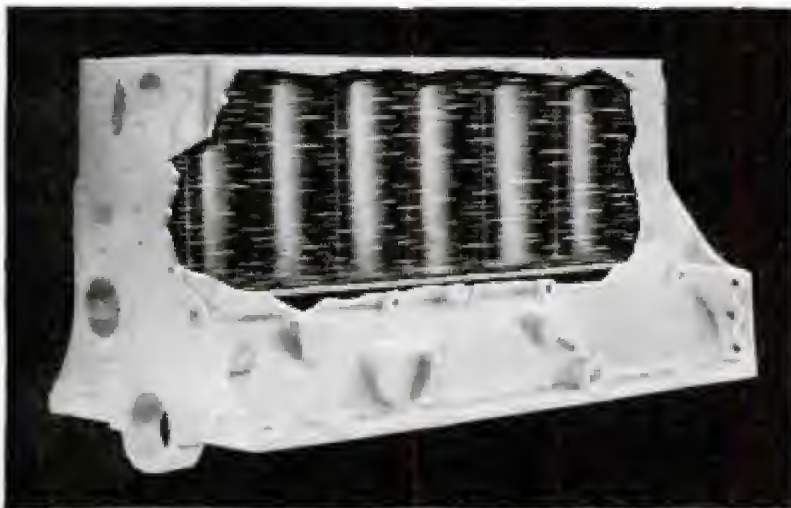
This is a brief story of such a car . . . the new Plymouth.

Plymouth cylinders have full-length water jackets. They reduce oil temperatures as much as 50°. See how water is directed to cool the super-hot exhaust valve seats. Even the clutch is cooled by air . . . the generator, too. Destructive heat is everywhere reduced . . . parts last longer . . . the engine runs "sweeter."

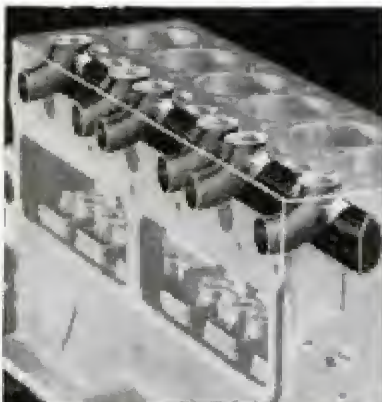
Engine vibration is "absorbed" by Plymouth's famed Floating Power engine mountings. New springs and proper weight re-distribution lessen vibration throughout the whole car . . . lengthening car-life.

This is only a fraction of what you can find out by driving a new Plymouth. Ask any Dodge, De Soto or Chrysler dealer.

Plymouth now only \$510 and up, f. o. b. Detroit. Easy terms by the official Chrysler Motors Commercial Credit Plan.



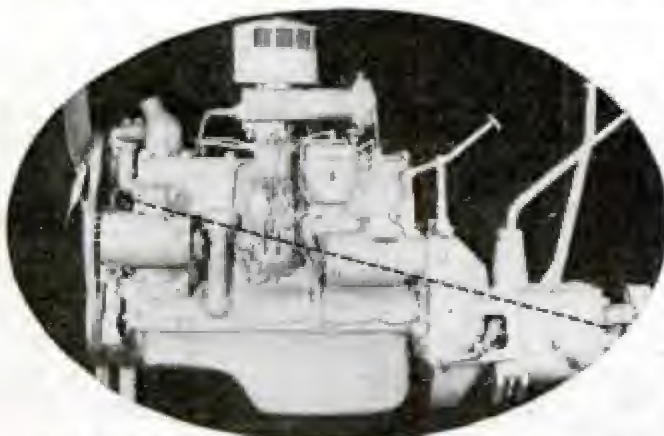
COOLING ENTIRE CYLINDER . . . full-length water jackets cool the cylinders . . . reduce temperatures of engine oil as much as 50°.



EXHAUST VALVE SEATS sprayed by high velocity cool-water jets.



VALVE SEAT INSERTS save owners up to \$25 on valve-grinding.



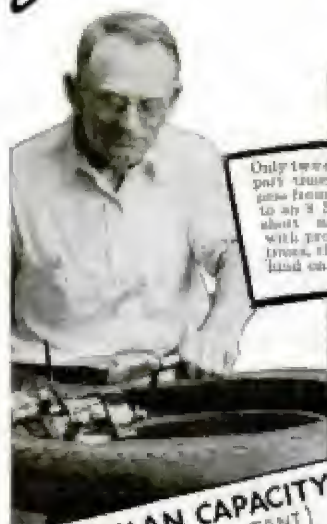
FLOATING POWER engine mountings "absorb" vibration; suspend engine in balance, free to "rock."

PLYMOUTH'S CORRECT RE-DISTRIBUTION OF WEIGHT . . . ENGINE AND SEATS MOVED FORWARD



BACK-SEAT RIDES as smoothly as front . . . the principle introduced by the famous "Airflow" cars.

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(WITH ONE ASSISTANT)
\$40⁵⁰ A DAY
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JUST TURNING JUNK TIRES INTO FABRIX MATS!

Possibilities stagger the imagination. Actual facts take your breath away. Gigantic National market running into Millions. And you can now supply it with JUNK TIRES as your raw material. What a business. What an unheard of Profit. Hire employees to make your product—pay salesmen a generous commission to sell for

START YOUR OWN FABRIX FACTORY

Get one thing out of your mind quick. FLOOR Mats are not "Door Mats." Millions—actually millions—of square feet of rubber and steel and coco mats are sold every year to Schools, Stores, Clubs, Factories, Public and Office Buildings, Homes, Railroads, Institutions and other industrial users. The few little mats sold to homes for door mats aren't a drop in the bucket compared to the demand for many other uses.

Now comes an invention that has turned the Mat business upside down. A new kind of industrial floor mat—superior to anything else on the market—more resilient, stronger, tougher—and beautiful. This new mat is selling against all competition for it is made from cheap JUNK TIRES for raw material. What a product, what a sales

you—spend your own time in supervision only—and you still can make a fabulous profit in this sensational new business. Responsible, clear-thinking men (business executives; salesmen and sales managers; merchants; Auto men; Smart Mechanics) dropping everything to jump in on the ground floor.

SMALL INVESTMENT REQUIRED

Right now we will appoint men to establish local factories in every part of the U. S. These men will have perpetual license to manufacture these sensational mats under our U. S. and foreign patents, and other patents pending. The investment required is reasonable—less than the down payment on a cheap car. Yet your starting equipment can be expanded quickly to give you a factory like the one in the picture, having an income capacity of over \$400 a week—\$20,000 and over a year.

\$21,528
A YEAR
PROFIT
OVER \$400
A WEEK
ON THE
CAPACITY
OF THIS
PLANT

5¢ TIRE
MAKES A
\$2⁰⁰
MAT

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May, 1935

Vol. 63, No. 5

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Secrets of the Rodeos

WHAT are the tricks of rodeo riding? How do contestants stay on the backs of the bucking bronchos and plunging steers? Is it really dangerous to ride the wild horses and to bulldog the steers, or are the animals trained to simulate viciousness? These and many other secrets of the rodeos are revealed in a behind-the-scenes story in the June issue by Andrew Jauregui, champion team roper. And you will find eight pages of action pictures in full color illustrating the many tricks of the riders and other performers described in the article.

Next Month

WHAT do you feed your dog? Do you give your pet what he likes or what he should have? Mistaken kindness in feeding often ends in disaster for all concerned. Next month Bob Becker not only tells you the kind of food your dog needs but gives you a few hints on how to persuade your pet to eat it.

Invisible War Planes

THE art of camouflaging war planes with colors has progressed to a point where such aircraft can be made virtually invisible as they approach to attack. Planes thus camouflaged become real phantom raiders of the air, with the ability to glide like ghosts through the sky seeking their prey. An article next month describes how war planes are camouflaged. You will find there is much more to it than merely painting the wings in various hues.

Taken for a Ride

WHEN a race car whizzes around the track, your eyes probably are watching the driver. Do you ever give a thought to the passenger who is riding with him? Mechanics do more than go along for the ride. Sometimes they win races. In June, "Spider" Matlock, famous riding mechanic, tells the inside story of the part mechanics who accompany the drivers play in the racing game.

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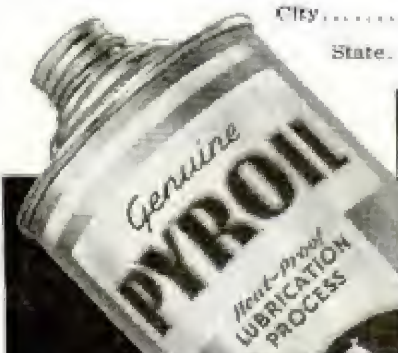
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Why Trained Accountants Command

High Salaries

—and how ambitious men are qualifying by the LaSalle Problem Method

GET this straight.

By "accountancy" we do not mean "bookkeeping." For accountancy begins where bookkeeping leaves off.

The skilled accountant takes the figures handed him by the bookkeeper, and *analyzes and interprets* them.

He knows how much the costs in the various departments should amount to, how they may be lowered.

He knows what profits should be expected from a given enterprise, how they may be increased.

He knows, in a given business, what per cent of one's working capital can safely be tied up in merchandise on hand, what per cent is safe and adequate for sales promotion. And these, by the way, are but two of *scores* of percentage-figures where-with he points the way to successful operation.

He knows the intricacies of government taxation.

He knows how to *survey* the transactions of a business over a given period; how to show in cold, hard figures the progress it has made and where it is going. He knows how to *use* these findings as a basis for constructive policies.

In short, the trained accountant is the *controlling engineer* of business—the one man business cannot do without.

Small wonder that he commands a salary five to ten times as great as that of the bookkeeper. Indeed, as an independent operator (head of his own accounting firm) he often earns as much as the president of the big and influential bank in his community, or the operating manager of a great railroad.

Some Examples

Small wonder that accountancy offers the trained man such fine opportunities—opportunities well illustrated by the success of thousands of

LaSalle accountancy students.* For example—one man was a plumber, 32 years old, with only an eleventh grade education. Today he is auditor for a large bank and his income is 325 per cent larger.

Another was a drug clerk at \$30 a week. Now he heads his own very successful accounting firm with an income many times as large.

A woman bookkeeper—buried in details of a small job—is now auditor of a great hotel, and her salary mounted in proportion to her work.

A credit manager—earning \$200 a month—moved up quickly to \$3000, to \$5000, and then to a highly profitable accounting business of his own which nets him better than \$10,000 a year.

And What It Means to You

Why let the other fellow walk away with the better job, when right in your own home you can equip yourself for a splendid future in this profitable profession?

Are you really *determined* to get ahead? If so, you can start at once to acquire—by the LaSalle Problem Method—a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—this without losing an hour from work or a dollar of pay.

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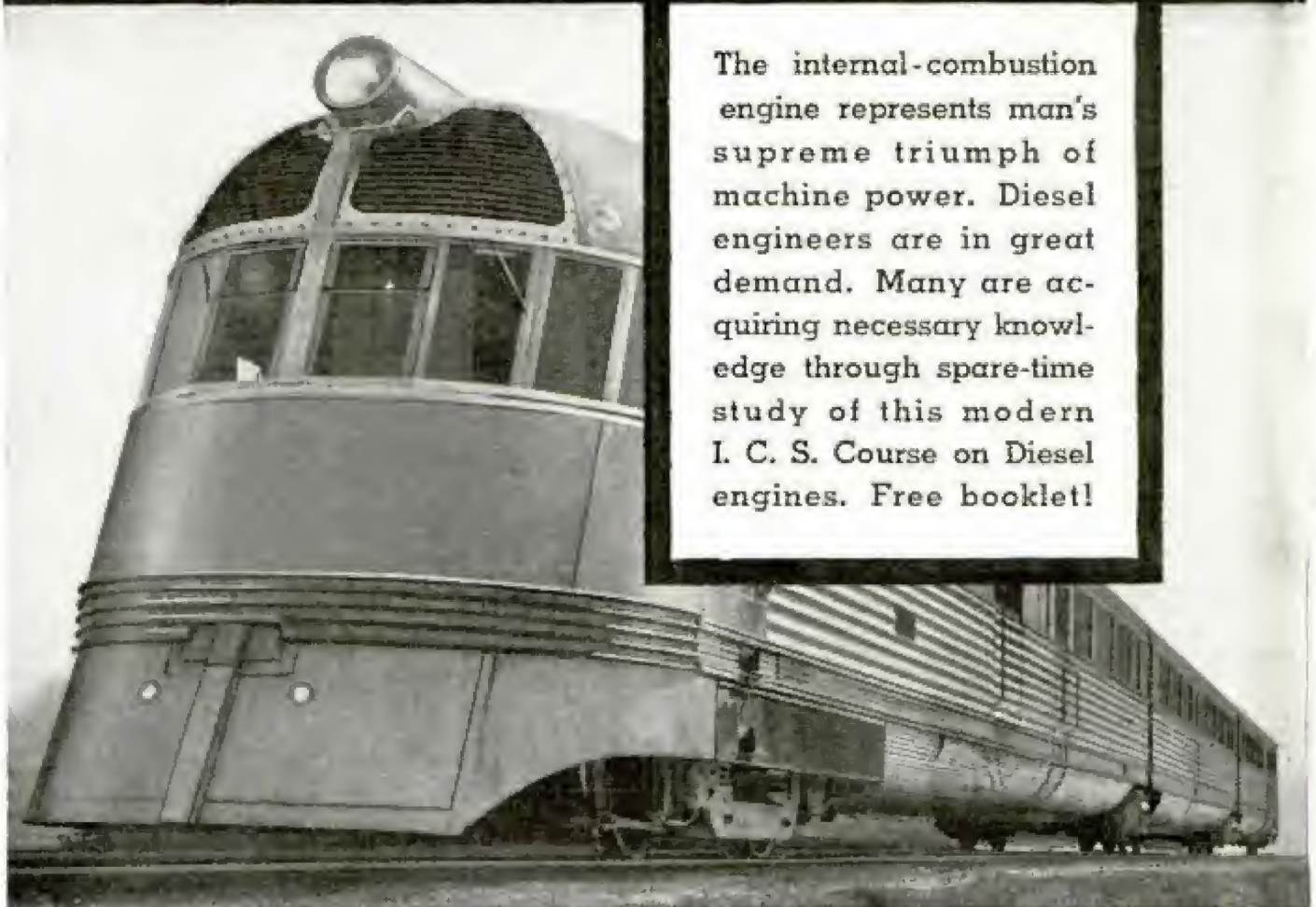
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| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Heating | <input type="checkbox"/> Chemistry | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Wood Millworking | <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Ventilation | <input type="checkbox"/> Coal Mining Engineer | |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Navigation | <input type="checkbox"/> Air Conditioning |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Machinist | <input type="checkbox"/> Steam Engineer | <input type="checkbox"/> Boiler Maker | |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Steam Electric Engineer | <input type="checkbox"/> Textile Overseer or Supt. | |
| <input type="checkbox"/> Development and Protection of New Products | <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Cotton Manufacturing | |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Woolen Manufacturing | |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> R. R. Locomotives | <input type="checkbox"/> Agriculture | <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Bridge and Building Foreman | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> Poultry Farming | <input type="checkbox"/> Radio |
| | <input type="checkbox"/> Gas Engines | <input type="checkbox"/> R. R. Bridge and Building Foreman | <input type="checkbox"/> Marine Engineer | |
| | <input type="checkbox"/> Diesel Engines | | | |
| | <input type="checkbox"/> Aviation Engines | | | |

BUSINESS TRAINING COURSES

- | | | | |
|--|---|---|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Service Station Salesmanship | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Office Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> First Year College | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Lettering Show Cards | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Civil Service | <input type="checkbox"/> Cartooning |
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STATEMENT OF CIRCULATION OF POPULAR MECHANICS MAGAZINE, State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared Willis S. Brown, who, having been duly sworn according to law, depose and say that he is the business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the circulation of the aforesaid publication.

Average net paid circulation for the issues of July, 1934, to and including December, 1934, is 320,841.

WILLIS S. BROWN.

Sworn to and subscribed before me this 23rd day of February, 1935.

J. GRAHAM, Notary Public.

(My commission expires June 16, 1936.)



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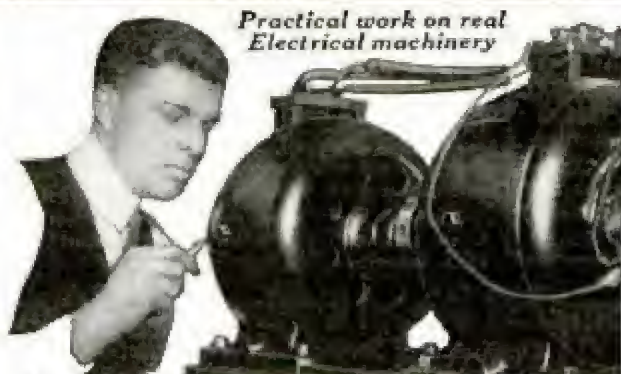
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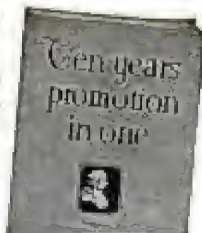
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**to these
two men
when I said:**



NO!

I'm not interested. That's what this fellow said. Today he would be ashamed if I gave you his real name.

I will Train You at Home in Spare Time For a GOOD JOB IN RADIO

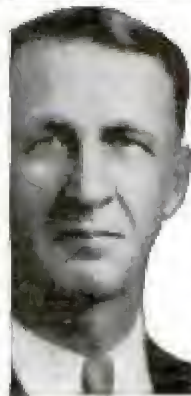
These two fellows had the same chance. Not long ago they each clipped and sent me a coupon, like the one in this ad. They got my book on Radio's opportunities.

S. J. Ebert, 49-B Quadrangle, University of Iowa, Iowa City, Iowa, saw that Radio offered him a real chance. He enrolled. The other fellow, whom we will call John Doe, wrote that he wasn't interested. One of those fellows who wants a better job, better pay, but never does anything about it. One of the many who spend their lives in a low-pay, no-future job, because they haven't the ambition, the determination, the action it takes to succeed.

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| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier | |
| <input type="checkbox"/> Accountancy and C.P.A. | <input type="checkbox"/> Railway Mail Clerk | |
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| <input type="checkbox"/> Service Station Salesmanship | <input type="checkbox"/> Illustrating <input type="checkbox"/> Spanish | |
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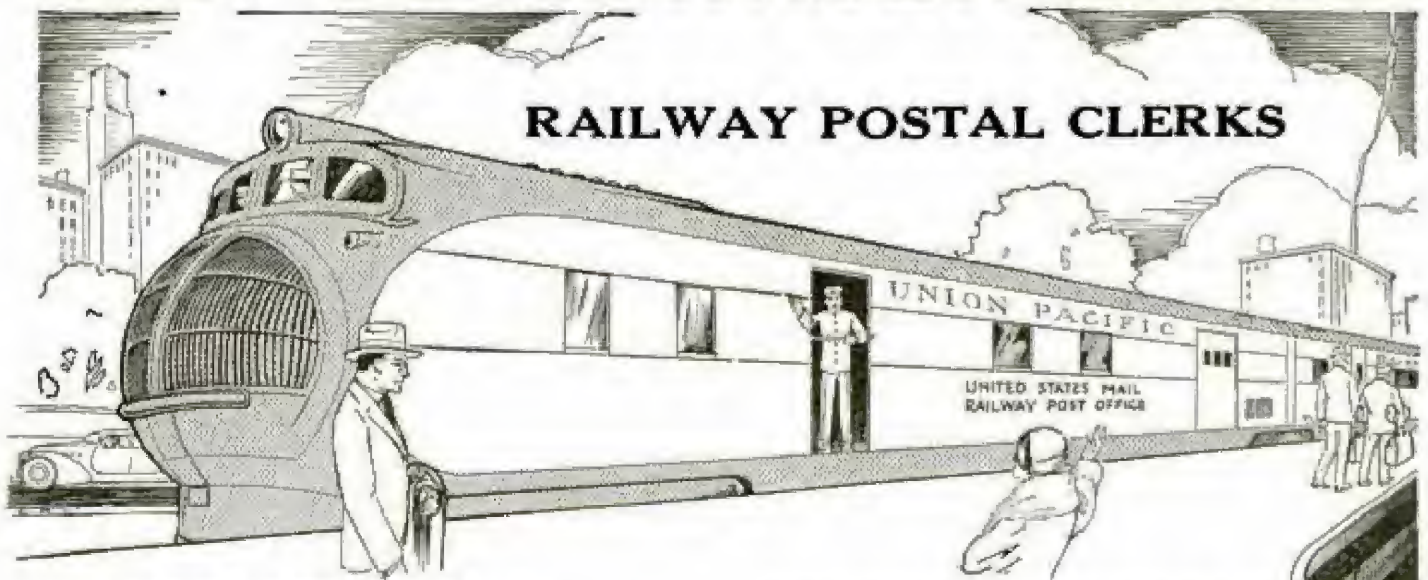
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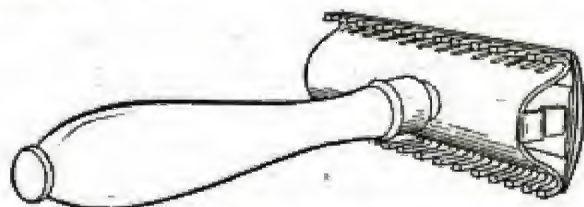
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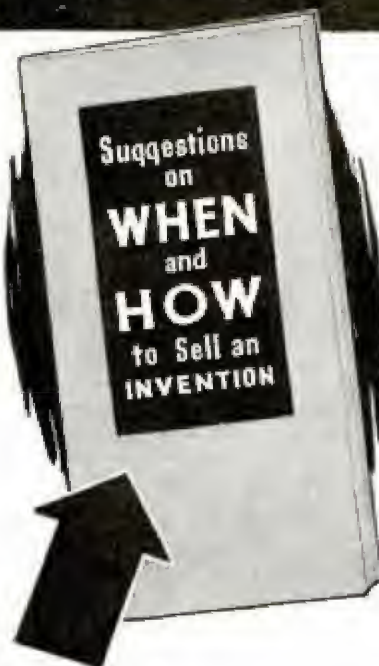
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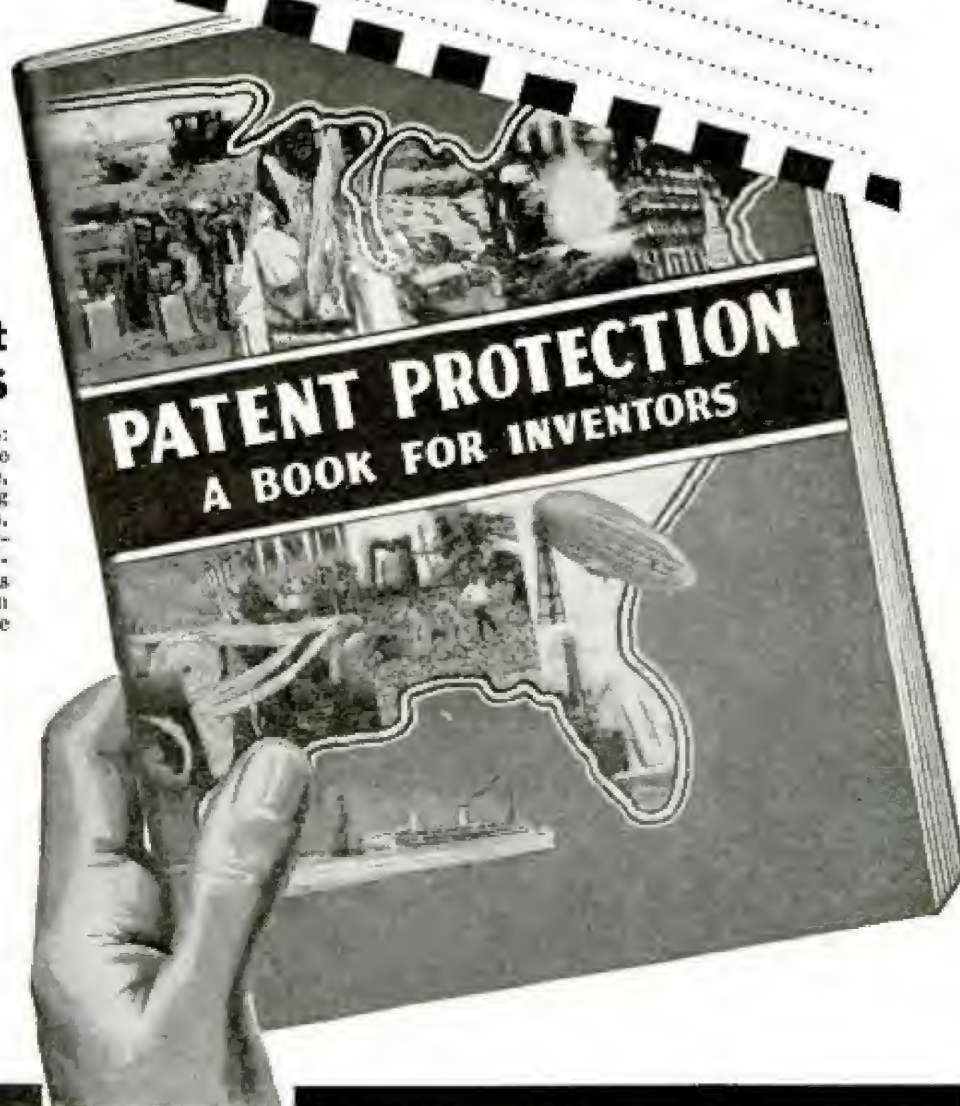
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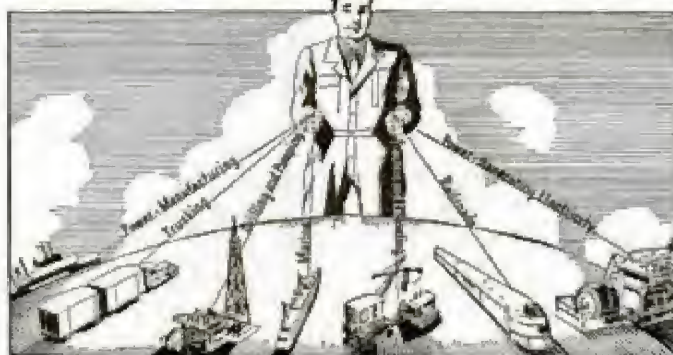
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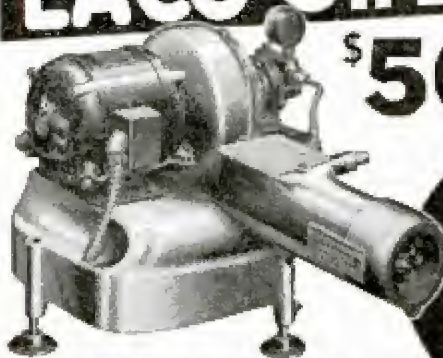
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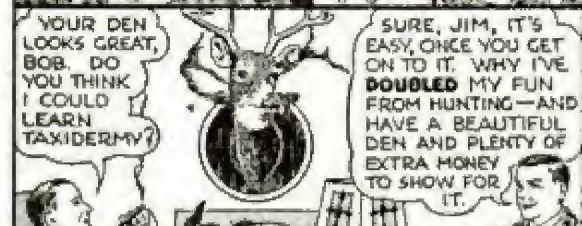
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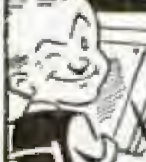
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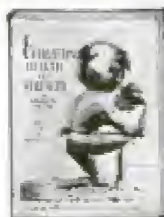
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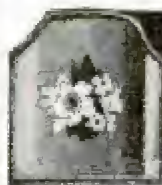
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DOLLARS Daily! Operate profitable mail-order business. Details. Duffy, Covington, Kentucky.

UP To 203% profit! Amazing No-Flat makes tires puncture-proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flat, Dept. J-372, Cincinnati, Ohio.

CALIFORNIA Flower heads sure fire fast sellers. Big profits. Low prices. Catalog free. Mission No. 10, 2328 W. Pico, Los Angeles, Calif.

AMAZING Profits selling colored folks. Hair preparations, bleach cream, perfumes, incense, 300 products. Write for free samples. Valmor, 5249-EN Cottage Grove, Chicago.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

AT Last a home treatment for pyorrhea. Distributors wanted. Supreme Laboratories, 1700 South Oden, Los Angeles, Calif.

NEW Invention cures foot troubles. Big demand. Lang Company, Forsyth, Georgia.

\$8.00 HOURLY. Amazing Karno refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karno, Dept. J-108, Cincinnati, Ohio.

DOUBLE-EYED Self-threading needle packages, size 3/0. Blind people thread them. Invaluable for failing sight, necessary for good sight. Sample, particulars 10c. Agents wanted. Wm. Oglesby, Vandalla, Ill.

AGENTS: Make up to 1000% profit selling cleaner, polish, shampoo, vanilla, tonic laxative, spot remover, etc. Your name on labels. Free sample. Standard Chemical, Dept. E-55, Dayton, Ohio.

I WANT Men for local tea and coffee routes paying up to \$42.50 a week. No capital required. Everything furnished. Write Albert Mills, 8962 Monmouth, Cincinnati, O.

FOAMEX, A 50c article, pays 150% profit. Our guarantee protects you. Write, Foamex Company, Ferry Annex, San Francisco, California.

ENGRAVED Initial plates, nameplates, signs, numbers. Enamel finish, five colors, big profit. Hilton Specialty, 29 Portland, Providence, R. I.

NEW Household specialty. Housewives grab it. Whirlwind seller, 100% profit. Fill-Or-Siphon Co., 234 E. Manchester, Los Angeles, Calif.

SALESMEN — Distributors — Sensational profit with amazing new automatic stripping tool. Works like magic! Anyone can use it. Does perfect stripping work—any width—on autos, bicycles, furniture, walls, signs, etc. Sells on sight. Write today. Midwest Sales, 1337-C Monadnock Bldg., Chicago.

MARRIED Man with spare time to distribute free samples coffee, flavoring, food products and make customers. Must devote at least two hours daily and be satisfied with up to \$1 in an hour. Permanent. Blair, Dept. 321-E, Lynchburg, Va.

HIGHEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 45 East Eleventh Street, New York.

DISTRIBUTORS: A few quick easy sales daily nets you \$58.00 weekly. Represent manufacturer — Later — amazing self-sealing bandage that breathes. Wonderful demonstrator. Irresistible appeal. Exclusive territory. Neway, D-39 South Clinton, Chicago.

WHOLESALE Catalogue free, 500 best sellers. Paty Co., 1107 Broadway, Somerville, Massachusetts.

GREATER Money-maker. Quality electric water heater. Retail \$1.95, wholesale 65c, agent's sample \$1. "Realproducts," 8908 Phillips, Chicago.

EVERYONE Needs our product. Up to 400% profit on each sale. Send 25c for two popular selling sizes and details. Selfseel, 404 North Wells, Chicago.

PERFORM Amazing feats. Earn big money. 4 professional magic trick samples 10c; 12 different—25c. Complete apparatus, patter, instructions. Nutrix, 77 W. 47th St., New York.

FIRST Time in America, one-tenth usual price. Individuals, stores buying instantly. Write, N. B. Co., 316 Gerrans Bldg., Buffalo, N. Y.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, HD-4702 No. Racine, Chicago.

LARGE Souvenir books—Extraordinary profits! Sample and particulars 10c. Elfko, 525 South Dearborn, Chicago.

SEND Hose size for samples and opportunity for \$20 week job. Just show sensational guaranteed hosiery to friends. Dignified, pleasant, easy work. Everything supplied. Wilkmit Hosiery, Desk E-37, Greenfield, Ohio.

NEW Different pleated curtain stretcher—curtains attached in 30 seconds. Low priced—100% profit. Pocket-size sample furnished. Evans Mfg. Co., MD-42, Cincinnati, Ohio.

AGENTS Wanted—All territories—Big money-maker for go-getters—send \$1.25 and receive "Quickweld Electric Torch" using storage battery, retelling at \$2.50. Practical and useful tool for auto-repairmen, battery and service stations. Herma Mfg. Co., 37 Pulaski St., Glen Cove, N. Y.

AGENTS—Make \$25.00 week selling Yankee duster; 100% profit. Scheff, 3748 North Lawrence, Chicago.

FEATHER Pictures, Popeye pipes, silhouette puzzles, novelties. Greatly reduced. Stamp appreciated. Norust Sales, 390 Grand Ave., Rochester, New York.

FREE Literature describing many money making plans. Belfort, 4042 N. Keeler, Chicago.

AGENTS Sell 5 glasses California orange jelly, 25c. 200% profit. 5 glass sample 25c. Cutter Company, 1138E Hyde Park, Inglewood, California.

PENNY Each. Mirror finish window sign letters. Free samples. Atlas, 7941 Halsted, Chicago.

MAN Wanted—Manufacturer established 35 years will finance responsible man with complete stock of guaranteed finest foods, groceries, good health products, toiletries, farm and home necessities—you pay when sold. Mighty attractive plan. Excellent opportunity for good living right from the start with steady increase for industrious man. Pays better than most occupations. Anderson of Utah sold over \$330 and Jack of Wisconsin sold over \$308 in one week. Pleasant work. Experience unnecessary. No slack seasons or layoffs. Write for No-Investment offer. McConnon and Company, Room 66ES, Wilton, Minn.

AMAZING New money-maker—Beautifully embossed signs in many colors. Sell like wildfire. No competition. Sample free. Synagraf Co., 257 S. Spring St., Los Angeles, California.

AGENTS: Men and women. Sell articles that are needed in every home daily, get our proposition before you accept any other. Trout Products, PM335, Hickory, Ky.

REGULAR Income—Quick returns—No canvassing. McArthur Co., Desk 5, Butte, Montana.

GET Our offer for a real surprise. Earn \$5.00 daily in your spare time. Full time workers make much more. Mail postal for details. No obligation. A. Kennedy Co., Kokomo, Indiana.

MAKE Extra money! Write for our special offer and catalog of household deals, cosmetics, extracts, etc. Make big money selling your friends and neighbors. Clyde Collins Chemical Co., Dept. 15D-1, Memphis, Tenn.

DISTRIBUTORS For "Ramo" wanted. Every lady a prospect. Send 15c for sample. Ramo, 34 Elmore Road, Rochester, N. Y.

YOU'RE Seeking bigger profits. Our line offers unusual opportunity. Attractively packaged beauty products. New. Different. Sample with complete territory offer, 10c. Crystal Products Co., Box 214, Quincy, Massachusetts.

PENNY Each. Large sizes. Non-tarnishable window sign letters. Free mirror finished samples. Atlas, 7941 Halsted, Chicago.

FREE Literature outlining mail-order and other profitable business plans. J. Haddock, 4617 Nevada, Chicago.

450% PROFIT Magic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$9.00. Sample 10c. New Method Co., Desk PMG-28, Bradford, Pa.

100% PROFIT In the mystery cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retail 35c. Sample and sales plan 25c. New Method Company, Desk PM-28, New Method Bldg., Bradford, Pa.

CARDED KH-Rat, chick tablets, etc., offering profit up to 90c card on \$1.20 sale. Write Farm Products, Flat River, Missouri.

MAKE Name plates and other glass signs. Instructions free with 25c sample. Progressive Sign Works, Station U, New York City.

MEXICAN Feather pictures. Great profit. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

CASH Income daily resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 128, Marion, Ind.

SUCCEED With your products. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

SOMETHING New in photo medallions and sterling silver photo rings. Big profits. Free catalog. Gibson Photo Jewelry Co., Inc., 835 McDonald Avenue, Brooklyn, N. Y.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 18 West 22nd, New York.

MAKE More money taking orders. Shirts, ties, underwear, dresses, hosiery, raincoats, coveralls, pants, uniforms. Outfit free! Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Balco," 1084 Washington, Boston, Mass.

MAKE Products yourself. Formula catalog free. Kemico, 45, Parkridge, Ill.

AGENTS: Smash go prices. Santos coffee 12c lb. 4-oz. vanilla 8 1/2c. \$1.00 size tonic 14c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

PROFITABLE House business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS—Opportunity to make money; book containing 37 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

"HOW To Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! F. W. Johnson, Mgr., Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

PORTRAIT Agents throughout the world. Lowest prices, portraits, frames. Catalog free. Picture Man Friedman, 528 Cornelia, Dept. 9, Chicago, Ill.

A BUSINESS Of your own—Making sparkling glass door plates, desk plates, numbers, signs, checkerboards, mirrors. Illustrated book free. Palmer Signs, 512, Wooster, O.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

COSTS 1c—Sells 25c. Make non-explosive cleaner from Benzene Crystals, 1c gallon. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

BE Independent. Own your business; experience unnecessary. Selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$250,000 deposited insurance department. Universal Policy, 716-A Lefcourt Bldg., Newark, N. J.

HIGH-GRADE SALESMEN

SALESMEN—Familiar with garage and car dealer trade. Sell new specialty for every motor. Necessity. K & G, Box 2050, Birmingham, Ala.

SELL Stores or homes. Big new line. Over 60 items. Up to 600% profits. Repeats. Superba Co., S411, Baltimore, Md.

SALESMEN To represent America's largest direct-selling manufacturer of high-grade exclusive mattress, sold to consumer on a deferred payment plan. Some territories available. Comfi-Coli Corporation, 43 Hospital Street, Providence, R. I.

HERSHEYS, Baby Ruth, Oh Henry candy deals. 1c-3c display and punch deals. Living scale. Steady employment. Casterline Bros., 1924 Sunnyside, Chicago.

YOUR Opportunity. Oil companies need it. Saves time, eliminates fire hazard. Repeats. Sample and particulars \$2. Safe-T-Speed, Box 3778, Portland, Ore.

ACTIVE Advertising specialty salesmen write us for details. Potter Mfg. Co., Eugene, Ore.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. E-U-PPM, Freeport, Ill.

AUTO Accessory salesmen. Free deal for dealers. Irresistible appeal. Complete line auto accessories priced right. 25% commission daily. Exclusive territory. Outfit free. National, 1910-CF Wentworth, Chicago.

MEN Wanted—By shoe manufacturer, established 31 years, to take orders for remarkable line of more than 200 styles of highest quality shoes for every purpose, including special bargains at \$1.99 and \$2.99. Good pay every day and your own shoes at factory prices. No experience needed. Sales outfit free. Write Mason Shoe Manufacturing Co., Dept. H11, Chippewa Falls, Wis.

MAKE Big money steadily. High grade coveralls, shopcoats, pants, shirts, summer suits. Advertising on back. Fast sellers. Free outfit. Strong Mfg. Co., 901 West Jackson, Dept. N-4, Chicago.

SELL Quaker's super-styled quality shirts. Big cash commissions; cash bonuses. Low prices. Ties, hose, underwear too. Complete new spring line ready. Samples free. Write Dept. P5, Quaker Colonial Bldg., Broadway at 31st, New York.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mase. New aspirin deal—6 tablets 5c. 83 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 5810, Spencer, Ind.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2031 N. Third St., Milwaukee, Wisconsin.

NEW Line process engraved stationery \$2.95 per thousand with free cut service. Comm. \$1.00. Big selection. Outfit free. National Engravers, 1510 W. Van Buren, Chicago.

SALESMEN: Sell complete line gummed labels, calendars, memo books, and business stationery. Special features. Free deals. Write quick. Big commission daily. Attractive sales portfolio free. Lionel, Dept. BR, 312 South Hamilton, Chicago.

SELL Union label printing at half! Business stationery, cards, blotters, sales books, memo pads, etc. 30-40% commission advanced. Free outfit. Consumers Press, R-82 W. Washington, Chicago.

SALESMEN—Sell collection systems. 400% commission. Sayers Systems, 2801-123 Sheffield, Chicago.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesman or distributors. Protected territory. Write Economy Rubber Co., 749 Burkhardt, Dayton, Ohio.

NEW Invention softens water from faucet instantly; sensational demonstrator. Softette, EE-751 Kansas City, Kansas.

ADVERTISING Fans—Novelties for coming season, 25% commission. Exclusive territory open. Washner Mfg. Co., 303 Irving Ave., Brooklyn, New York.

PENNY Each. Mirror finish window sign letters. Free samples. Atlas, 7941 Halsted, Chicago.

ARE You interested in big profits? Every business a prospect. Make \$10 to \$50 each sale. A new sales idea. Send for complete information. Modern Office Appliance Co., 53 Park Place, New York.

NEW Federal, state tax and code laws force, under severe penalties, the keeping of proper business records. Immense demand for our officially approved tax record. Sells at sight. Repeat commissions without call-backs. Men selling 5 to 25 daily. \$3.50 each profit every sale. Commonwealth Publishing Co., 508 So. Dearborn, Chicago.

MEN With cars. Sell drug trade. Popular line. Established 58 years. Good commission. Requa Mfg. Co., 1193 Atlantic Av., Brooklyn, N. Y.

SIDELINE: 2-Color business cards. Calendar on back. Jacksonprint, Independence, Missouri.

NEW Auto radio. World's cheapest. Sample. Terms. J-20th Century Co., Kansas City, Mo.

SELL Process embossed printing \$3.95 thousand, with free cut service. Worth \$6.00. Nothing like it! Commission \$1.00, advanced. Experience unnecessary. Outfit free. United Engravers, P-6155 South State, Chicago.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 209 East Ontario Street, Room 235, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4375 Ravenswood, Chicago.

SALESMEN—Sell collection systems. 400% commission. Sayers Systems, 2901-123 Sheffield, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SALES Demonstrators. U-Kan-Plate with pure silver. 1 oz. polish 20c, 8 oz. \$1. Justice, 904 Walnut, Philadelphia.

MAKE More money taking orders. Shirts, ties, underwear, dresses, hosiery, raincoats, coveralls, pants, uniforms. Outfit free! Nimrod Company, Department 65, 4922-23 Lincoln Avenue, Chicago.

SELL Punchboards direct to dealers from world's leading punchboard factory. Wholesale prices. Enormous profits. Big commissions. Sales kit free. Hartlich Co., 1407 Jackson, Chicago.

FREE Booklet describes 87 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

HELP WANTED

MAN Wanted—Manufacturer established 45 years will finance responsible man with complete stock of guaranteed finest foods, groceries, good health products, toiletries, farm and home necessities—you pay when sold. Mighty attractive plan. Excellent opportunity for good living right from the start with steady increase for industrious man. Pays better than most occupations. Anderson of Utah sold over \$330 and Jack of Wisconsin sold over \$308 in one week. Pleasant work. Experience unnecessary. No slack seasons or layoffs. Write for No-Investment offer. McConnon and Company, Room 66ES, Winona, Minn.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 10A.

BIG Money growing mushrooms. Cellar, idle places. Supplies furnished. We buy. Free book. Mushroom Growers, FM-433, N. Clark, Chicago.

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848DE Lincoln Ave., Chicago.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 34-JD, 1956 S. Troy, Chicago.

SEND Hose size for samples and opportunity for \$20 week job showing "anti-sag" guaranteed hose to friends. Dignified, easy work. Everything supplied. Wilkin—Employment Manager, Outfit E-237, Columbus, Ohio.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 253, Toronto, Ont.

IF You want to get your groceries and household supplies at wholesale, and a wonderful chance to make \$9.50 a day besides, send me your name immediately. No capital or experience necessary. Complete outfit furnished on trial. Albert Mills, 8956 Monmouth, Cincinnati, Ohio.

AGENTS—Moss corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 51 Searle Bldg., Rochester, N. Y.

EDUCATIONAL AND INSTRUCTION

YOU Can learn to write! Give yourself a chance. Let "Five Easy Lessons in Short Story Writing" teach you by graded exercises. Market guide attached to book. Also certificate which entitles you to avail yourself of author's criticism services. Price \$1. Clarion Publishing Co., Suite 502P, 201 N. Wells, Chicago.

\$105-\$175 MONTH. Government jobs. Men-women, 18-50. Qualify for coming examinations. Common education. Full particulars free. Write immediately. Franklin Institute, Dept. B3, Rochester, N. Y.

BECOME A successful investigator. Experience unnecessary. Interesting publication and particulars free. National System, Box 425-G, Fremont, Nehr.

LEARN Fast and correct figuring. New methods. Frederick A. Smith, 2410 Smalley Court, Chicago.

LEARN Chiropody. Complete course by correspondence. Evans Foot Inst., Montgomery, Ala.

BECOME An investigator—a secret service agent. Write International Secret Service Institute, PM-55, Hoboken, N. J.

ACETYLENE Arc-Welding, metal finishing, tool die making, torch soldering, collision courses. Wolverine School of Trades, 1400 W. Fort, Detroit, Mich.

LEARN New trades in your spare time—Refrigeration, oil burners, air conditioning servicing. Herkimer Institute, 1819 Broadway, New York.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

AUCTIONEERING — Rochester Correspondence School, approved under New York state laws. 34 Atkinson, Rochester, N. Y.

NATIONAL Correspondence School of Lettering. Learn sign work, show cards. Write for particulars. 318 Market Arcade, Buffalo, N. Y.

FOLDER Free! New advertising and letter writing plan. As high as \$55 per week to start. Stamp appreciated. Reliance, 638 Wall, Ridgewood, N. J.

LEARN Machinist trade, tool and die making, designing, automatic and hand screw machines. Get experience on actual jobs. Leading shops approve our methods and employ our men. Steady demand for skilled men. Days—evenings. Send for free book. Allied Screw Machine Company (School Div.) 401 W. Lake St., Chicago.

STUDY Law at home. Four courses; degree. Est. 1892; free catalog. Chicago School of Law, Reaper Block, Chicago.

GET U. S. government job—start \$105-\$175 month. Men-women, age 18-53. Are you eligible for eligibility test? Get our free questionnaire—find out. No obligation whatever. Instruction Bureau, 101, St. Louis, Missouri.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

861 PRACTICAL Ways to Reduce Farm Labor and Expense and Increase Income. One farmer writes he would not part with this information for \$100, if he could not duplicate it. Nothing experimental. These ideas have all been put to test and proven practical. Send today for a copy of our Handbook for Farmers and get ready to put these ideas into operation for your own benefit. Pay postman only 98 cents and the postage when he hands you the package. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

CARTOONING—COMMERCIAL ART

MODERN Cartooning methods. Cooperative Research Company, 132 West 14th Street, New York.

CARTOONING Course—30 lessons, 500 illustrations with drawing pens and pencils. \$1.00 complete. Scovell Studios, Box 610-P, Hollywood, Calif.

ARTISTS' Monthly market bulletin. Sample copy: 20c. Feather, Parkville, Missouri.

AMATEUR Cartoonists can earn \$35.00 weekly, spare time, duplicating cartoon advertisements. 3-M Syndicate, Argyle, Wis.

ADVERTISING AGENCIES

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine rate-guide, free. Chicago Union Agency, 20 West Jackson, Chicago.

LEARN Advertising quickly at home. New easy practical plan. No text books. Interesting booklet free. Page-Davis School of Advertising, 3601 Michigan, Dept. 3431, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago.

FOR ADVERTISERS

25 WORDS 26 Magazines, 3 months \$1.50. One inch \$6.00. Bug Herald, 3233 Country Club, Wichita, Kans.

24 WDS. Monthly-weekly combination \$4.98. Magazine free. Darnell, Jackson, Tennessee.

25 WORDS 25 Magazines, 3 months \$1.50. One inch \$6.00. Plans. 36 Liberty St., Brooklyn, New York.

SPECIAL Advertising offers write: Goodall Adv. Company, Box 1592, San Francisco.

BUSINESS SERVICE

ANY Information desired 25c coin and up. Fred Klotz, Reading, Pa.

ALL International legal matters. Lic. Victorios Prieto, Mexican Attorney at Law, P. O. Box 122M, Juarez, Mexico.

DELAWARE Charters; fees small; free forms. Chas. G. Guyer, 901 Market St., Wilmington, Del.

RUBBER STAMPS AND OFFICE SUPPLIES

2 LINES 25c, 3 Lines 35c, indexed 100 extra. Rubber Stamp Co., Tunkhannock, Pennsylvania.

RUBBER Stamps, two lines, twenty-five, three lines thirty-five cents. Sunset Stamp Works, Seattle, Wash.

CUSHION Mounted, 2 lines 25c; 3 lines 35c. Coin. Stamp Works, 814 Bradley, Peoria, Ill.

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nehr.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

LET Us print your pamphlets, booklets, circulars, folders, stationery, gummed labels, letterheads, book-plates. Low prices. Halldeman-Julius Co., Box J-1, Girard, Kans.

GUMMED Stickers—Beautiful 2-color. Your 3-line copy only 25c. Draper Co., Culver City, Calif.

2000 BUSINESS Cards neatly printed \$1.40. Zeller, 511 N. E. Halsey, Portland, Oregon.

500 WATERMARKED Bond standard size letterheads, envelopes, billheads, statements \$1.75. Illustrations. Bradshaw, 3214 Huron, Chicago.

NEARGRAVUREMBOSSD — 250 Letterheads, envelopes \$3.99 delivered. Samples. Solldays, Knox, Indiana.

BETTER Grade letterheads, statements, most anything, 500—\$1.60. Gray, 4077 Hubbard, Robbinsdale, Minn.

QUALITY Printing. Lowest prices. Samples? Write Community Press, Kewanee, Ill.

BETTER Labels for less. Samples. Wolf, 6618A Quinby, Cleveland, Ohio.

1000 CARDS \$1.00. Letterheads, envelopes, billheads \$2.25. 5000 business booklets \$3.50—(prepaid.) United Printing, Pottstown, Pa.

TRIAL—100 Hammermill letterheads, envelopes \$1.00. Race Printery, Hudson, N. Y.
DISTINCTIVE 3x5 Bond circulars \$1.35 1,000, 5,000 \$1.50. 5,000 white 6 1/2 envelopes \$7.50. Pubs. Mansfield, Ark.

1,000 GUMMED Mailing labels, your copy, \$1.85. Jobey, 2016 Warren, Chicago.

5,000 ELEGANT Colored envelope slips, \$3.90 prepaid. All printing low prices. Samples. Goodprint, Harrisonburg, Va.

PERSONAL Or business cards, tickets. Quality extraordinary. Standard size, 1,000—\$1.00; 2,000—\$1.50. Any copy. Promptly. No deposit. Pay postman. VanDorn Card-crafters, 24R, Ottawa, Ill.

LETTERHEADS, Envelopes, statements, 500, \$1.10, plus postage. Samples. Raymond's, Newport, N. Y.

1000 BUSINESS CARDS, card case, \$1.50. Miller, Printer, Ambler, Pa.

GUMMED Labels—Your copy printed that satisfies. Wetzel, Valhalla, N. Y.

STATIONERY, Circulars, checks, loose-leaf, ruling, binding. Commercial Press, Batavia, Ohio.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

PRINTING OUTFITS AND SUPPLIES

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Pfeiffer, 42-A, 6 Columbia St., Newark, New Jersey.

REBUILT Presses, guaranteed like new, list 3c. Exchange D10, 22 Orient, Meriden, Connecticut.

PRINT Your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.90; job presses, \$11 up. Write for details. Kelsey Co., X-11, Meriden, Conn.

MAKE Cuts—Simple, cheap process—Halftones, line cuts, type matter. Anderson & Son, 12612 Greenwood Ave., Blue Island, Illinois.

PRINTING Presses, type, supplies. Lawrence, 1426 South St. Francis, Wichita, Kans.

PRINT Your own circulars, envelopes, with home made press costing less than \$1.00. Illustrated instructions 10c. Carl Edquist, Odessa, Minn.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

BARGAINS Used presses, type. Send stamp. Box 15, Cambridge, Mass.

PRINTING Presses, type and equipment. Lists 3c. Landis, Richtland, Pa.

TYPEWRITERS, DUPLICATORS OFFICE DEVICES

TYPEWRITER Bargains—Genuine late model Underwoods, Royals, Remingtons, L. C. Smiths refinished 100 office models at 60% saving. Fully guaranteed—10 day trial—easy terms—10c a day. Free catalog. International Typewriter Exchange, Dept. A-501, 231 West Monroe St., Chicago.

TYPEWRITER \$12. Multigraph, mimeograph, and other office machines. Write 810 Priddy Bldg., 170 North LaSalle, Chicago.

NEW \$1.75 Automatic adding machine. Fully guaranteed. Bassett, 1458J Hollywood Avenue, Chicago.

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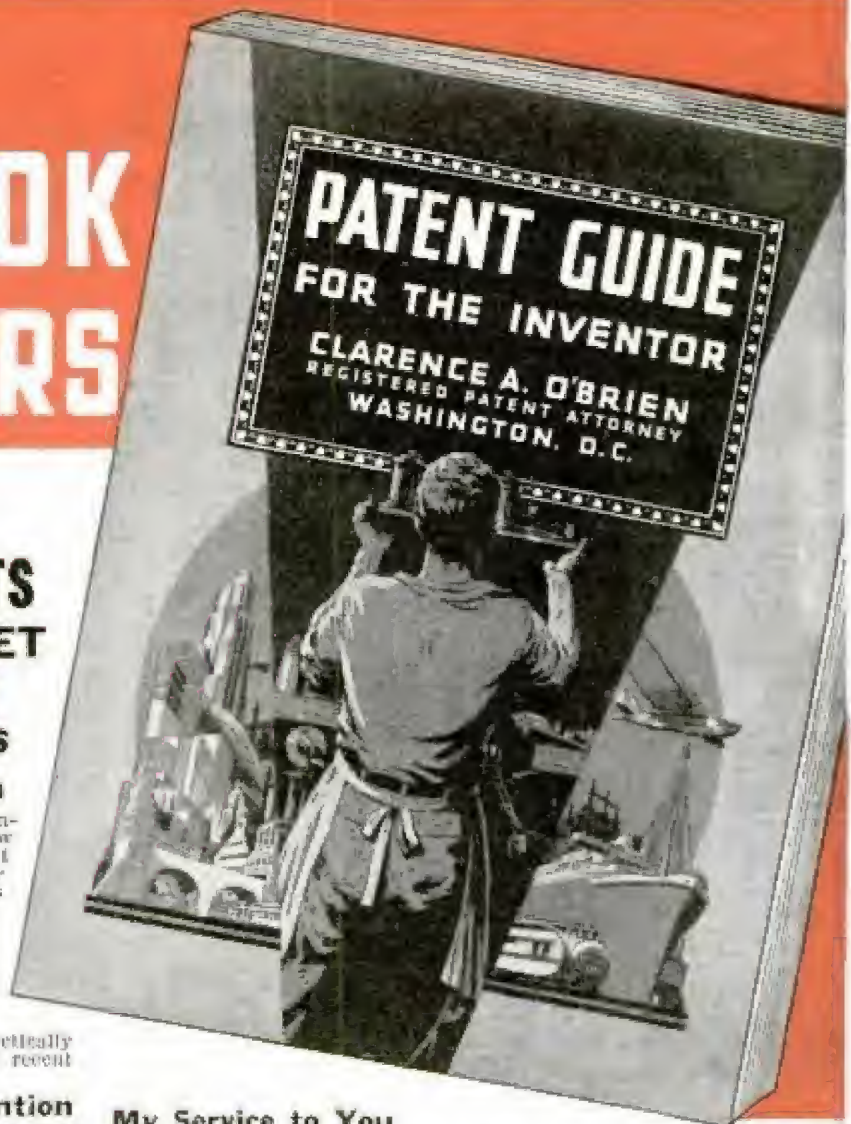
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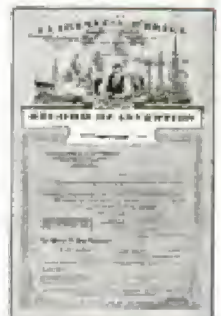


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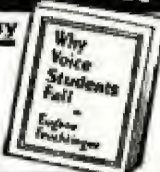


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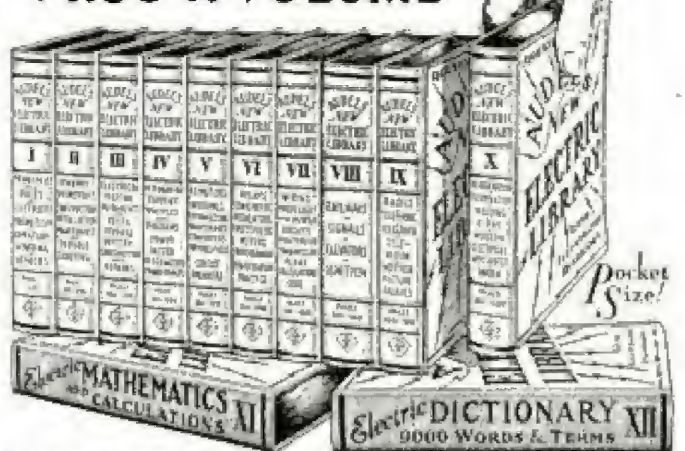
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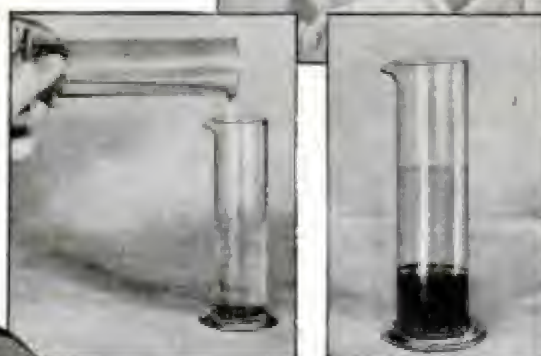
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Popular Mechanics Magazine

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Vol. 63

MAY, 1935

No. 5

HOUSES *for* EVERYBODY



\$1,350⁰⁰ F.O.B.

Latest **SCIENCE**
Achievement

By H. W. MAGEE

DO you drive a car or pay \$15 or more monthly rent? If so, you probably are in a position right now to own your own home.

Recent contributions of science to the building industry make it possible for virtually anyone to own a home if he can afford to operate an automobile or to pay fifty cents a day for rent.

The same conditions which make it possible for the man of very modest income to own a home also enable him to start his own business today. A filling sta-



\$375⁰⁰ F.O.B.

A Five-Room Home Costing \$1,350, Plus Freight, and a Summer Cottage and Garage for \$375, Plus Freight

The Steelox Company

American Rolling Mill Co., Middle town, Ohio

Steel Buildings, Chicago, Ill.
Chicago, Ill.
Central 0466

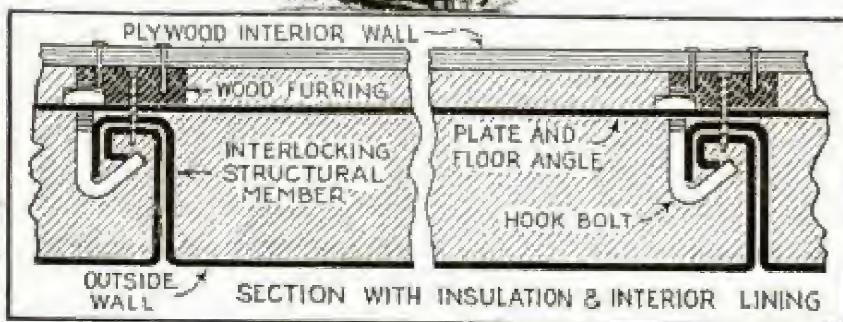
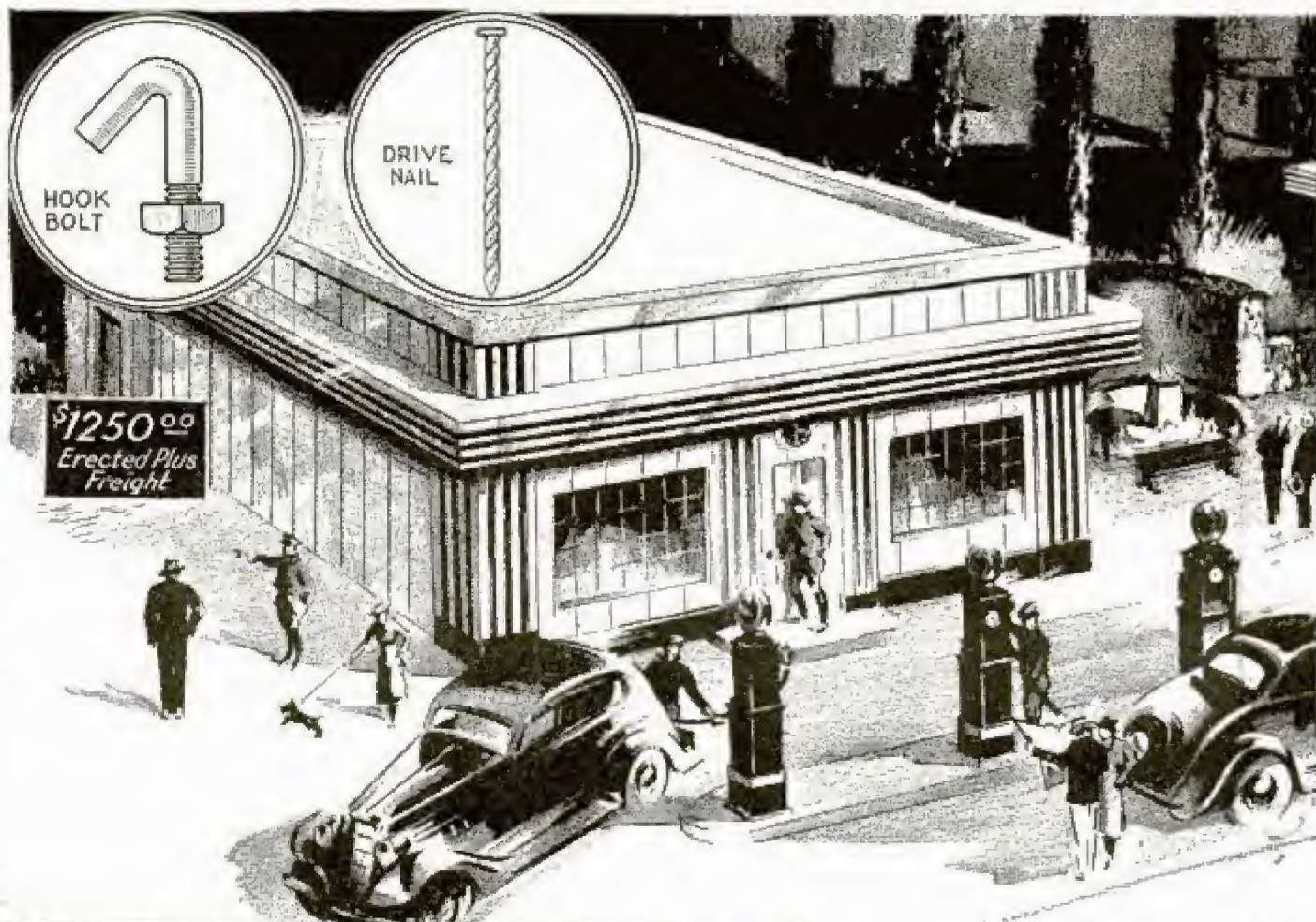


Diagram of Wall Section and a Filling Station Which Can Be Bought and Erected for \$1,250, Plus Freight; Hook Bolt and Spiral Drive Nail Are Used in Assembly

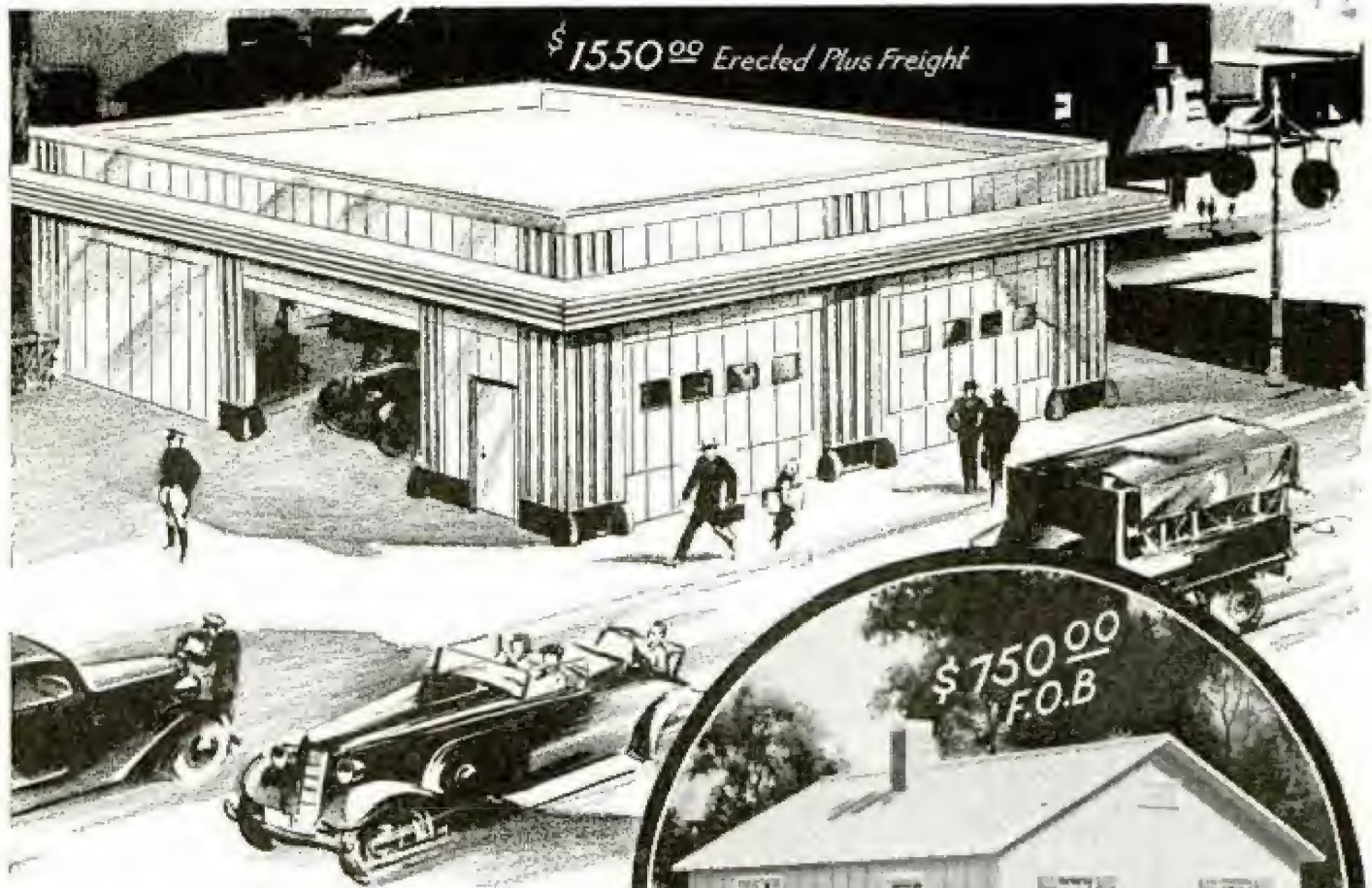
A good lot for such a home can be purchased for about \$250, making a total investment of \$2,000 for the house, ready to be occupied, including the lot on which it stands. But you do not need \$2,000 ready cash to build your house on this lot. Your local bank or home loan company, with the cooperation of the government, has

a plan for loaning money direct to the home builder, such loans representing as much as eighty per cent of the value of the house.

So all the cash you require is enough to purchase your lot and make the small down payment on the house. The balance is handled like rent, payments being made at as low a rate as \$15 to \$17 a month on a long-term, self-liquidating loan. These small monthly payments, arranged like rent, pay off your loan with all interest and charges. You can purchase also a one-car garage of the same type of construction as your home and have it erected on your lot for \$235, or a two-car one for \$400.

tion, a greasing station or a small store can be built by a person of no greater means.

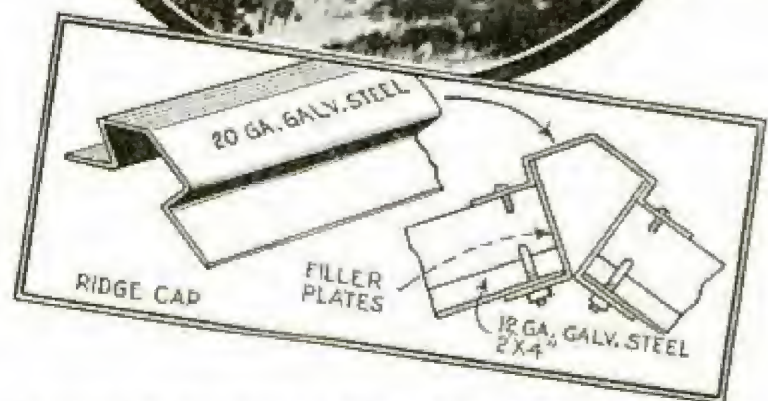
Here are some of the things your money will buy today in a home or business structure. You can obtain a substantial five-room home, tight, well insulated, fire resistant and lightning and vermin proof for \$1,350, complete with wiring and lighting fixtures, plumbing and plumbing fixtures, hardware and all other accessories. This building, insured against structural failure, fire, lightning or windstorm damage, can be erected for from \$400 to \$600—even less if you do most of the work yourself, and you probably can do it because the construction is extremely simple.



If you want to go into business, you have the same kind of opportunity. A filling station can be erected for \$1,250, a two-car greasing station for \$1,550, a small store, shop or office building for about \$1,000. Or you can buy and erect a week-end cottage or tourist's cabin and garage combined for about \$500. The commercial buildings can be torn down and reassembled elsewhere but the homes are intended to be permanent. You can buy a three, four or five-room home complete or you can purchase only the walls, roof and incidental parts for construction, depending on your local dealers for complementary materials and furnishings.

Homes, shops, garages and stores at such figures, well within the reach of the average man working for daily wages, have been made possible by taking advantage of the newer building materials, by cutting parts to size at the factory and by a simplified form of construction which reduces labor costs.

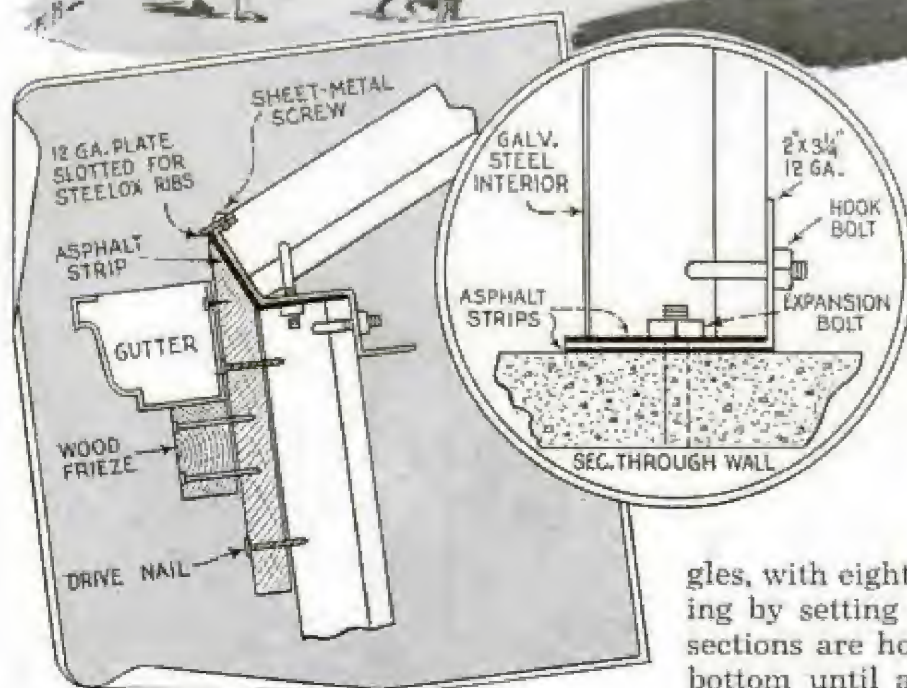
Walls and roofs are of interlocking, self-framing steel construction, the material



Greasing Station Costing \$1,550 Erected, Plus Freight; Cottage for \$750, Plus Freight, and Roof Assembly

used being twenty-gauge heavily galvanized steel. The walls themselves form the structural members which serve as a frame to support the structure. For homes, the foundation usually is a concrete slab, although any other material can be used or a basement can be included in your plans.

The unit for both walls and roof is a



An Inexpensive Shop Costing \$750, Plus Freight, and Diagrams Showing Details of Construction

patented channel-shaped panel known as "Steelex." This panel is sixteen inches wide, wall height and three inches deep. It has flanged sides so the flange of one panel slips into that of an adjoining panel. These interlocked flanged sides serve as structural members sixteen inches apart. The panels are fastened in position with simple hook bolts and a furring strip is attached to the flange for finishing interior walls. This not only serves as a nailing strip but destroys thermal conductivity through the interlocked members.

With such construction, erecting a build-

ing becomes a simple matter. Here's all there is to building your home with these steel units. Angle irons, wrapped with asphalt strips with a burlap backing, are attached to the concrete foundation with expansion bolts. A column or corner of your building is formed by one of the steel panels, bent longitudinally at right angles,

with eight inches on each face. Starting by setting up such a corner, the wall sections are hook-bolted into place at the bottom until a window space is reached. Here shorter panels are set in place and the work proceeds as before. Then a top plate is laid along the panels and the wall units are hook-bolted to it. Short sections over windows and doors are attached—and your first wall section is finished.

After the other walls are erected in similar manner, two roof sections, slanting up from each side, are hook-bolted to the ridge and plate, the roof units are dropped into position and hook-bolted, top and bottom, after which a special ridge cap is slipped into position. That finishes the exterior.

Next, you install the door and window frames, coat the inside with a special

(Continued to page 136A)

25/

Northrop Corp.

POPULAR MECHANICS

El Segundo, Calif.

645

Attack Planes Bristle with Guns and Bombs



Latest Army Attack Plane Which Is One of the Most Deadly Weapons of the Air Service; It Carries Two Men, Six Heavy Machine Guns and 500 Pounds of Bombs

Sixty attack planes now under construction for the army will constitute some of the most deadly weapons of this branch of the air service. These low-wing monoplanes are intended to do their fighting close to the ground, supplementing the work of present model pursuit and bombing planes. The attack models each will carry two men, six heavy machine guns and 500 pounds of bombs.

230.

BICYCLE STEERED BY HANDLE HAS SMALL FRONT WHEEL

Copenhagen
Denmark boasts a type of bicycle which makes it almost impossible for the beholder, at first glance, to tell whether the rider is going or coming. It is equipped with a small front wheel and a standard size rear wheel and looks like a tricycle minus one wheel with the rider mounted backward. It is steered by a handle which turns the small front wheel and is pedaled in the usual manner.



Bicycle with Small Front Wheel Which Is Steered with Single Handle and Pedaled in Usual Manner

What You Will See at San Diego Exposition



Balboa Park

Architects Who Planned the Structures for the California Pacific International Exposition at San Diego This Summer Availed Themselves of the Lush Beauties Provided by Nature; Flowers and Shrubbery Decorate Many of the Buildings and Trees and Plants Form the Setting for Others; Above Is the Avenue of Palaces, a Thoroughfare of Spanish Renaissance Structures with the Tower of the Palace of Science in the Background; Left, Observation Tower and Exhibit Building Decorated with Living Flowers and Vines; Below, Festooned Walls of the Palace of Electricity and Varied Industries, an Example of the Modern Architecture



Architecture Contrasts Ancient and Modern



Ancient Indian Architecture and Spanish Buildings Contrast with the Ultra-Modern Among the Structures Housing Exhibits and Amusements; Above, a Section of the Spectacular Amusement Zone; Right, Entrance of the Palace of Fine Arts, One of the Architectural Gems of the Exposition; Below, the Spanish Section of Villages of the World Resurrects All the Charm and Romance of the Early Days When San Diego Was Founded



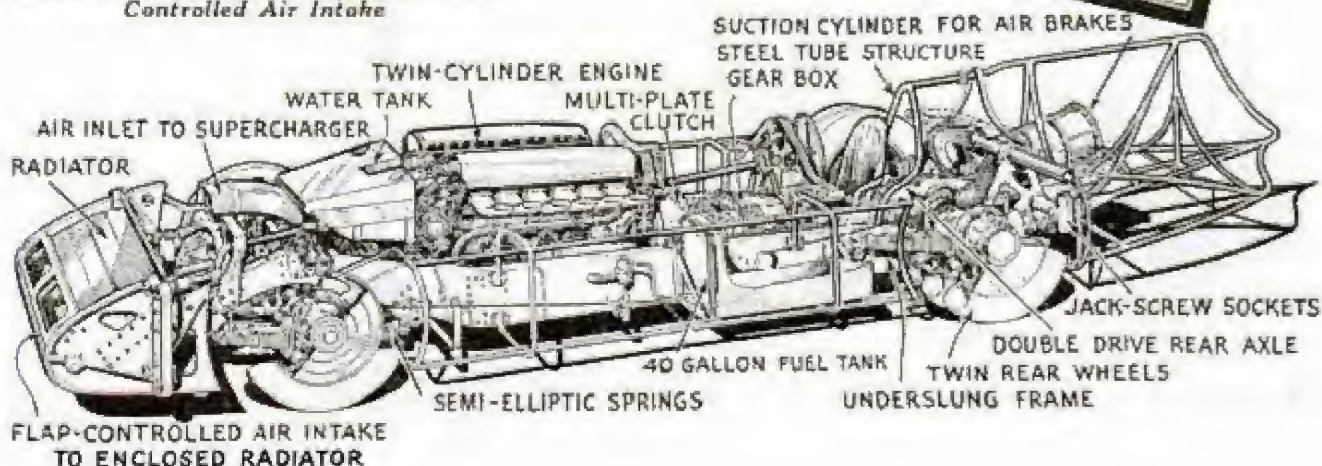
Better Streamlining Makes "Bluebird" Faster



Sir Malcolm Campbell at the Wheel of the Rebuilt "Bluebird" in Which He Broke His Own Automobile Speed Record at Daytona Beach, in March, with a Mark of 276.816 Miles an Hour, Nearly Five Miles an Hour Better Than the Old Mark; Better Streamlining Was Given Much of the Credit for the Increased Speed; This "Bluebird" Took in Air to Cool the Radiator through a Slot in the Nose Which Was Closed during the Timed Mile to Reduce Resistance; It Also Had Pneumatic Brakes, in Addition to Wheel Brakes, in the Form of Flaps Back of the Rear Wheels Which Could Be Elevated to Increase Both Resistance and Traction; the Seven-Ton Racer Was Again Powered by a Twelve-Cylinder Supercharged Rolls-Royce Engine Developing About 2,500 Horsepower



The "Bluebird" Making a Trial Run, and a Diagram of the Car Which Has a Wheelbase of 164 Inches and an Overall Length of 339 Inches; Note the Flap-Controlled Air Intake



ROUGH RIDERS *of the* DIRT TRACK



"WILD BILL" Cummings, winner of last year's Indianapolis race, and his riding mechanic in crash helmets. Below, picture taken from rear of another racer showing speedsters entering the straightaway.





FUELING a racing car at the pits and instrument board of a racer. The large dial shows the engine revolutions per minute by which the driver estimates his speed.

AT the end of the last Indianapolis race a fan was complimenting "Wild Bill" Cummings, who had just set a new speed mark in winning the classic.

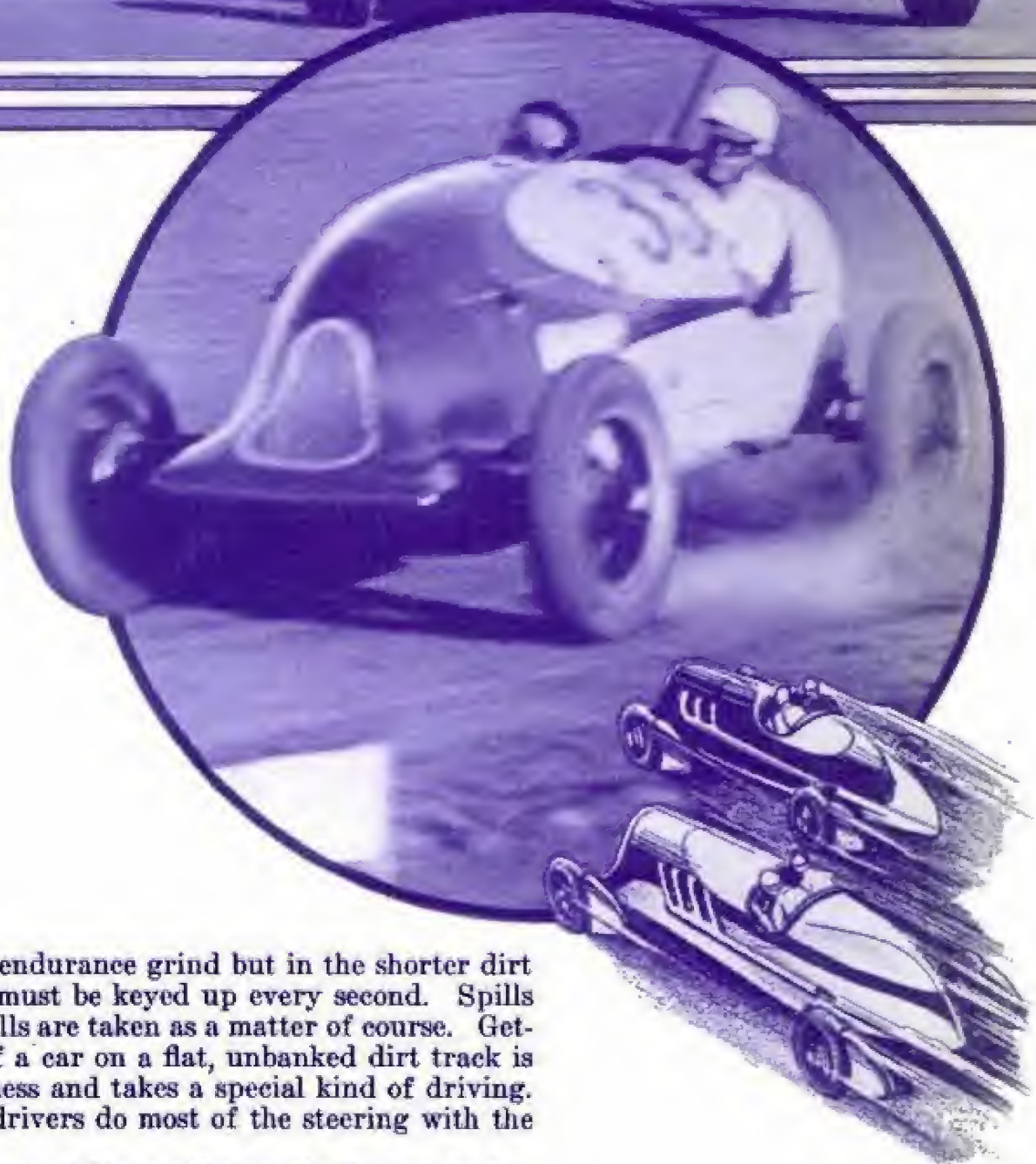
"You must be all worn out," the admirer said. "Just think of driving 500 miles in less than five hours."

"On the contrary," Cummings told him, "driving that race was comparatively easy. I rested some of the time. It's the short dirt tracks that really wear out drivers."

"Wild Bill" was right. Tough as the driver's job is, generalship and preliminary tuning up are what really count



PICTURE taken from back of another racer showing tightly bunched cars coming down the straightaway at more than 100 miles per hour. Right, taking a turn on a dirt track, using the accelerator, rather than the wheel, to do the steering.



at the Indianapolis endurance grind but in the shorter dirt track races drivers must be keyed up every second. Spills and unexpected thrills are taken as a matter of course. Getting the most out of a car on a flat, unbanked dirt track is an exhausting business and takes a special kind of driving. For one thing, the drivers do most of the steering with the foot throttle.

"In such races a car is in a skid nearly the whole distance," Cummings explains. "You bend the wheel to the left to start the slide, then twist it right and keep it there most of the time, with the car moving down the track at



GOING places in a hurry on the dirt track. Below, the start of a dirt track race. Note the wire screens at the fronts of the cars to prevent flying dirt from clogging the radiators and forcing cars out of the race because of overheating.



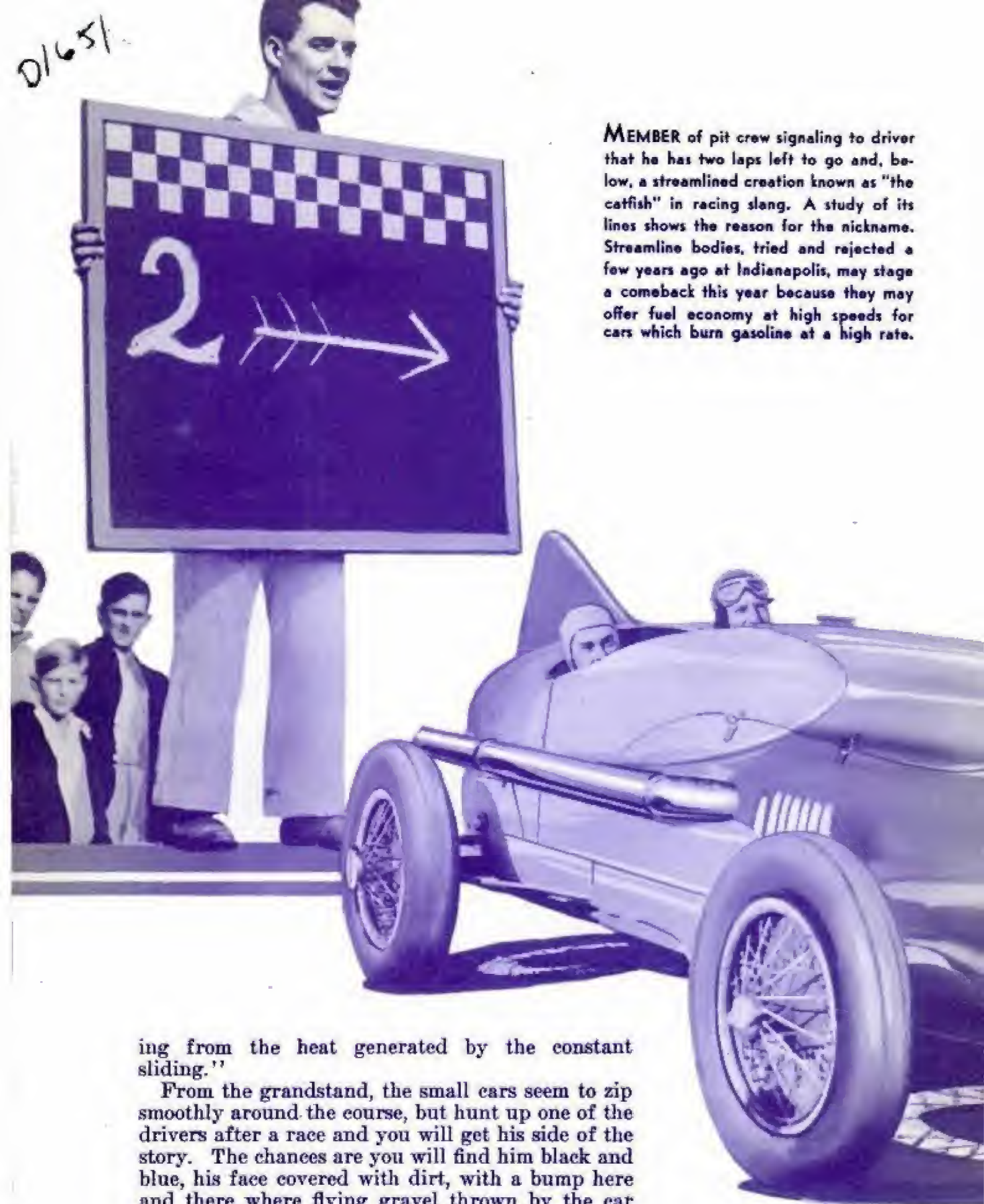
TOP, no car ever wins a race if it stands in the pits too long. This racer is taking aboard water, oil and fuel in a hurry and the driver is taking on water during a pit stop.

an angle. You do most of the steering with your foot. If you want to drift over to the right you ease up on the throttle and reduce the slide, but if you want a left turn you tramp on the gas and throw the rear end more to the right. Thus you control your direction and maintain a faster speed around corners. A driver rarely uses his brakes unless the track is so slick that the brakes help him go into a slide.

"With most of the car's weight resting on the right rear the rubber on that wheel is ground down fast and on some dirt tracks you change this tire every 100 miles. There's always a chance for a blow-out. Sometimes we find the inner tube is vulcanized into the cas-

D/651

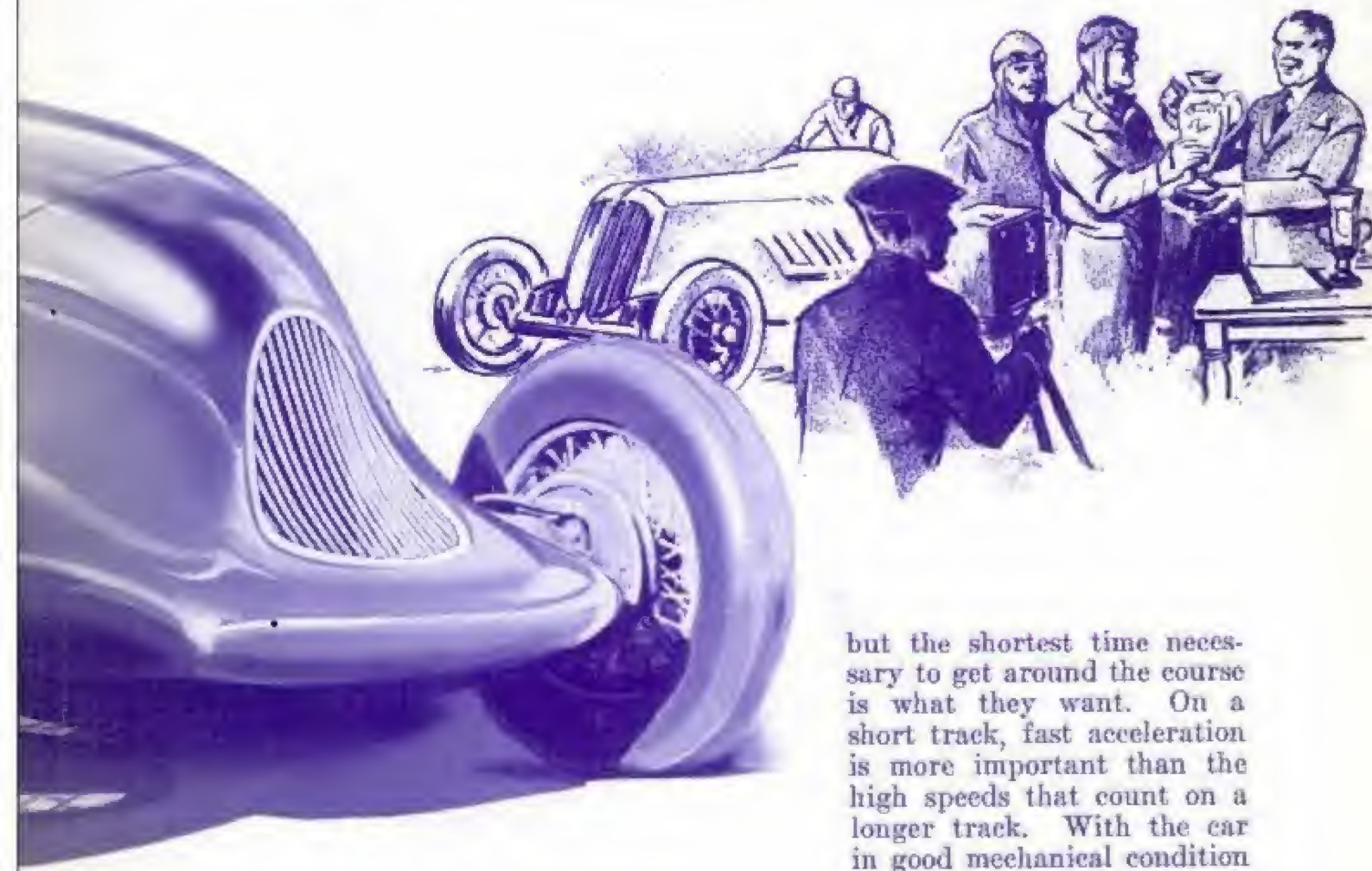
MEMBER of pit crew signaling to driver that he has two laps left to go and, below, a streamlined creation known as "the catfish" in racing slang. A study of its lines shows the reason for the nickname. Streamline bodies, tried and rejected a few years ago at Indianapolis, may stage a comeback this year because they may offer fuel economy at high speeds for cars which burn gasoline at a high rate.



ing from the heat generated by the constant sliding."

From the grandstand, the small cars seem to zip smoothly around the course, but hunt up one of the drivers after a race and you will get his side of the story. The chances are you will find him black and blue, his face covered with dirt, with a bump here and there where flying gravel thrown by the car ahead struck him. Drivers have had teeth knocked out and two or three sets of goggles broken during a single race.

Since tracks are of different lengths, the drivers prepare for each by changing the timing and gear ratios of their cars. Not always the fastest speed,



TOP, a spectacular crash during a dirt track race. Note the flying mud and the driver who is just being thrown from his seat.

but the shortest time necessary to get around the course is what they want. On a short track, fast acceleration is more important than the high speeds that count on a longer track. With the car in good mechanical condition and with a couple of screens fitted over the front to break up flying dirt, winning a race is partly luck, partly skill, and the rest is sheer nerve.

(Continued to page 118A)



THEY fly through the air with the greatest of ease. Above is an early racer caught with all four wheels off the ground just after it had struck a bump. Below, Germany is making a bid for speed records with this streamline race car which was photographed as it flashed around a Berlin track during a trial run.



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Canned Liquid Rubber Used to Make Molds

\$1.00 1/2 pt. can.

Rubber in liquid form, so prepared that it can be used direct from the can for making rubber molds, insulating tool handles and electrical connections or for waterproofing, can be brushed on like paint, several coats being applied to build it up to the proper thickness after which it is allowed to dry for several days. No heat is necessary in applying. In making molds of small animal figures, for instance, the surface of the dried rubber is greased with olive oil and plaster is applied to make a shell which will hold the mold in shape. Several coats of liquid rubber applied over a model before pouring the gelatin, in making a gelatin mold, add durability since the inside surface of the mold will be rubber. Rubber articles can be made by first making a plaster mold and shellacking the inside surface. After the liquid rubber has cured, the article is removed. Liquid rubber molds are suitable for molding plaster compositions, liquid marble and plastic wood. It makes possible the molding of many types of ornaments from a one-piece seamless mold.



Samples of Molds Made of Liquid Rubber Which Also Can Be Used for Insulating Tool Handles

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GUNSIGHT TO FIT ON SHOTGUN IMPROVES THE AIM

8171

Designed for easy installation on either single or double-barrel shotguns, a small sight has been introduced to improve the



Gunsight Similar to the One in Hand Is Shown Mounted between the Barrels of Gun

Frank E. Field

aim. It is made of blued steel, hard rubber or celluloid, measures one and one-half inches and slips into the groove between the barrels of a double-barrel gun. For a single-barrel gun, the sight is made with small flanges on each side with screw holes for attachment to the barrel. If ball or slug is used in the gun, the sight converts the shotgun to the purposes of a rifle.

8113.

FOOL-PROOF EXPLOSIVE FOUND

Announcement has been made of discovery of a high explosive, nitramon, which is virtually fool-proof. It is twenty per cent stronger than T.N.T. but has been shot at with rifles, thrown into fires, bored with hot irons, subjected to blowtorches and beaten with fifty-pound trip hammers without exploding. The only thing that detonates it is a full-size dynamite cartridge. It is free from the headaches which dynamite often causes among explosives workers. Essentially it is nitrate of ammonia, containing forty per cent of oxygen. It is a white solid, resembling caked table salt, works under water as well as in the air and does not freeze.

E. J. du Pont de Nemours & Co.

Wilmington Del.

VIOLIN IS MADE WITH ANGLES INSTEAD OF CURVES



Musical Instrument Like a Violin Except That It Is Formed of Angles Instead of Curves

Angles instead of curves are the features of an instrument resembling a violin produced by a California man. It is called a "violaol" and it is claimed it produces tones similar to those of old instruments used by the early monks for holy celebrations. It tunes higher than the ordinary violin and its tones are clear and flutelike, its final note corresponding to the last note on the piano. The sharp points caused by the angles, it is claimed, allow for higher string tuning as less pressure is needed.

"COLDEST" COLD IS MEASURED BY MAGNETIC THERMOMETER

Latest attempts to reach absolute zero, 273.15 degrees below zero on the centigrade scale, resulted in a figure one five-thousandths of a degree above that mark. Measurement at that temperature, where all liquids are solid and gases liquid, was taken with a magnetic thermometer in which special salts were cooled to the temperature of liquid helium, one and six-tenths degrees above absolute zero. Then the energy of the salts was lowered by putting them in a field of 30,000 gauss, or units of magnetism. Then the magnetic field was lowered quickly to twenty-five gauss, causing the theoretical unit magnets of the

salt samples to go to their normal random positions. But they needed energy to swing back and the sole place for obtaining this energy was from the heat of the samples. Thus, as the heat energy was used up, the sample became colder and colder. Shortly, however, the sample began to warm up to the temperature of the helium bath. The rate of warming up was measured by detecting the magnetization of the sample, from which was obtained a curve showing how magnetization varied with temperature. By prolonging the curve backward, the deduction was made that the lowest temperature of the sample was but one five-thousandths of a degree above the real bottom of all temperatures, or absolute zero.

LINEMAN TAPS "LIVE" WIRES WITH SIMPLE CLAMP

Connections to "live" wires can be made quickly and safely with a clamp operated by a clamp stick. Use of the stick gives the lineman full control of clamps and tap wire. The clamp is designed as a permanent connection for distribution transformer drops, economically providing a



Installing Clamp on "Live" Wire without the Danger of Touching High-Voltage Line

"disconnect" directly at the primary. The jaws, which take a wide range of conductor sizes, No. 8 solid copper to 4/0 stranded copper, will not twist off the line while the eye screw is being turned.

Handwritten notes and signatures are present throughout the page:

- Top left: *52*
- Left margin (vertical): *Alfred Grosvenor Pasadena Calif.*
- Bottom left: *2/19/35*
- Bottom left (signature): *Prof. W. J. ...*
- Right margin (vertical): *J. L. Co. Inc. Taylorville, Ill.*
- Bottom right (signature): *J. L. Co.*

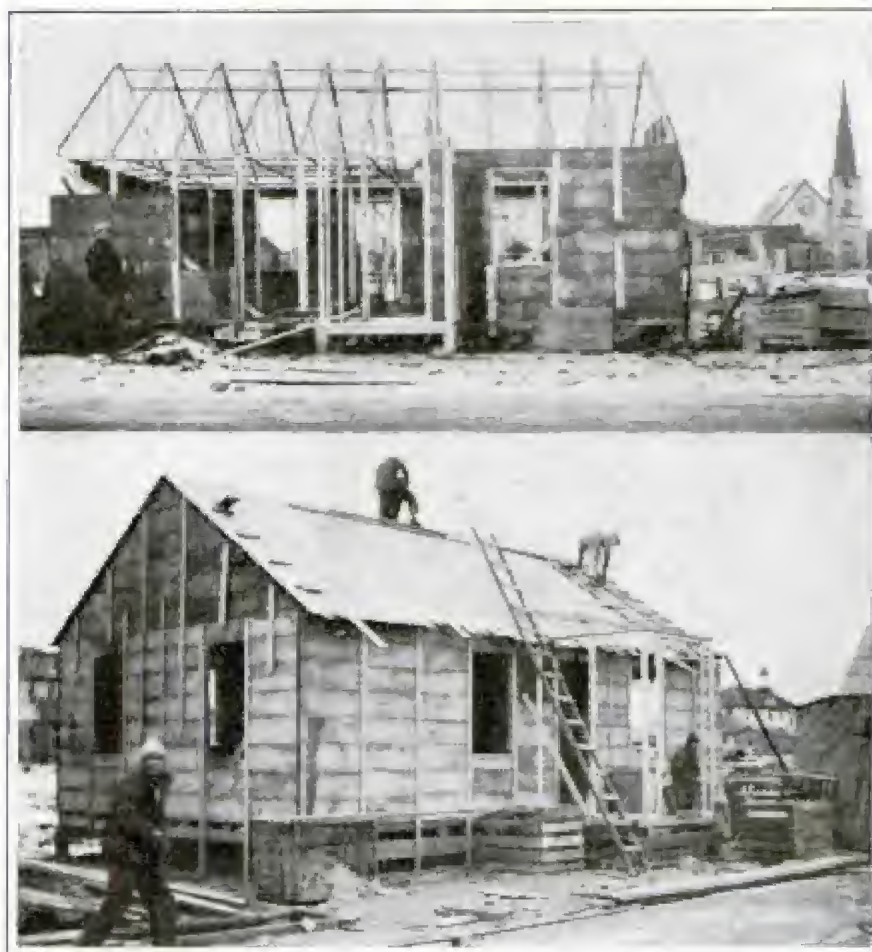
D1570.

POPULAR MECHANICS

659

Portable Cork and Steel House Banishes Cold

Two portable dwellings of steel frames and cork-board walls and roofs were sent to Alaska to replace homes destroyed in the disastrous Nome fire a few months ago. The experiment has shown that this type of construction, in which the insulation is the structure instead of an addition to the structure, is admirably suited to cold regions in particular. The material for the homes was cut to size at the factory, the parts were numbered and the houses were sent by boat to Nome where, despite adverse weather conditions, the dwellings were erected in ten days. It is estimated the cost of such construction is about one-fourth more than for ordinary frame structures, but to offset this, a saving of fifty per cent or more in fuel is claimed. In addition to complete insulation the cork and steel homes are fire resistant, vermin proof, immune to dry rot and impervious to moisture. The houses can be knocked down, moved and reassembled easily if the steel frames are bolted to timbers as a base. The corkboard is squeeze-fitted between the steel angles and secured with wire. Lumber is used over the corkboard roof and on this is laid composite roll roofing. Each Alaskan home is eighteen by thirty feet, sufficient for four small rooms, and each structure required two and one-half tons of steel and 5,500 feet, board measure, of corkboard. This type of construction permits optional finish, inside and outside, with stucco, brick veneer, sheet iron or stone as outside choices, and plaster, veneer panels or other finish for the interior. Provision is made easily for inside plumbing and wiring. Standard specifications call for steel doors and window sashes with provision for storm windows. Floors are of wood,



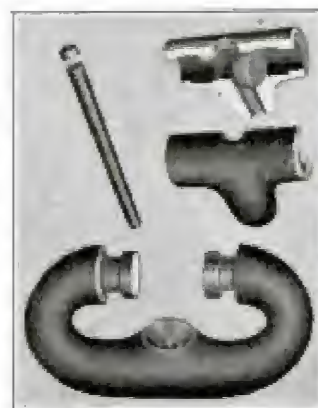
Steel Frame and Corkboard Walls of Portable House Adapted to Very Cold Climate; Materials Are Cut to Size at the Factory

laid over corkboard so that walls, floor and roof are completely insulated.

E201

DETACHABLE SHIP CHAIN LINKS SPEED UP REPAIRS

Detachable links for anchor chains have been introduced to speed up shipping operations. The links may be used as connecting members or repair members. Made of heat-treated nickel steel, the links have a strength of 125,000 pounds per square inch. Use of the links makes possible an anchor chain in which every link is the same length, regardless of the number of repairs.



Paldt Anchor

Cork I manufacturing Co. Inc. New York 155 E 44 St.

with and Butler, Pa. Chester, Pa.

NOTHING



By DR. P. G. WORCESTER

Acting Head, Department of Geology
University of Colorado

Boulder, Colo
OLD Mother Nature had no strong boxes to protect her wealth of gems, minerals and metals, so, like the miser, she buried her treasure. And seemingly she selected the most inaccessible places in which to conceal her vast riches, then erected every conceivable barrier to thwart those who would rob her.

But she underestimated man's ingenuity. The miner has not only braved the blistering desert, the frozen north, the steaming jungle and other natural obstacles between him and nature's buried treasure, but today the miner and engineer, using modern methods and equipment, are recovering wealth which seemed wholly out of reach only a few years ago.



Above, Miner Using Old Engine to Hoist Ore Bucket; Below, Loading Mining Machinery Aboard Airplane

The Cotabambas gold fields in Peru, for instance, lay undeveloped for years because nature had provided a barrier consisting of lofty mountains, impenetrable jungles, unbridged rivers and deep ravines. But nature forgot to extend her barrier

STOPS *a* MINER



into the sky and today mining machinery is being flown into the gold district by transport planes. When the work is completed, more than 700 tons of machinery will have been transported from the railroad at Cuzco, over the Andes mountains at 15,000 feet and landed at the mine head, a task necessitating more than 400 round trips by air.

A gold mine in South Africa illustrates the other extreme. Instead of using airplanes, mining is being carried on there with the aid of a refrigerator system of greater capacity than that employed in New York's Radio City. The shaft is more than a mile deep and the system blows into the mine 23,600 pounds of conditioned air per minute—greater than the weight of ore removed in the same time!

This air-cooled mine is significant because it proves that man is gradually overcoming the greatest barrier of all those



Top Photo Courtesy Pan-American Airways

Above, Unloading Airplane Freighter at Mine in Peru; Below Sluice Box with Plugs for Obtaining the Gold

imposed by nature to protect her riches. As surface deposits of metals and minerals are exhausted, he is digging deeper and deeper into the earth. And he must dig deeper still as the sources of supply on which he has always depended are depleted further. The three limits to deep min-

(Continued to page 122A)



The Swinging Arm of This Apparatus Marks Protruding Sections of Rock in Tunnel for Later Removal

TUNNEL "YARDSTICK" ON WHEELS SHOWS PROTRUDING ROCK

Engineers engaged in checking the diameter of the twenty-nine tunnels forming part of the Metropolitan aqueduct of Southern California use a yardstick on wheels to give them accurate measurements quickly and inexpensively. Known as a "junior jumbo," the apparatus rests on a light tramcar which can be lifted off the rails by two men to allow passage of regular tunnel traffic. On the front of the car is mounted a swinging arm supporting a revolving sleeve which is set on the tunnel's axis by means of light rays from rods swinging from the roof. Protruding rock is touched with whitewash, indicating sections to be cut away to provide clearance.

BELT SANDER REDUCES COSTS OF GRINDING JOBS

Offered as a means of reducing costs on sanding and grinding jobs, an inexpensive



belt sander is furnished with or without motor. Its length with the motor mounted at rear is thirty-four inches and its

width eleven and one-half inches. The sander weighs 125 pounds, hence is portable. The abrasive belt travels over a flat metal bed at a belt speed up to 4,000 feet per minute. It is valuable for grinding off burrs, smoothing off rough stampings, knocking down weld spots and grinding or sanding flat surfaces on wood, metal, composition materials, marble, slate and stone. The machine can be used on many jobs that are now being done either on larger machines or on a grinding wheel.

SAFETY RAZOR WITH LIGHT ILLUMINATES FACE

Light is thrown directly on the area of the face being shaved by an illuminated safety razor which combines a razor and a small flashlight of the fountain-pen type. The combination makes it entirely possible to shave in the dark if necessary.



Safety Razor with Fountain-Pen Type Flashlight Attached to Handle with a Small Clamp

The light is attached to the razor with a clamp and either the light or the razor can be used separately since the clamp can be detached from one or both.

Porter-Cable Machine Co. N.Y. Illuminated Razor Co. 18 E. 4th St.

Cont. Andrew W. Boone, 665 Chamber of Commerce Bldg.

Safety Glass Yields Like a Net under Impact

Bending without shattering, the latest safety glass yields under impact. While a blow will cause numerous cracks radiating from the point of impact, the glass will not break. A film having the resiliency of rubber holds the two sheets of glass together and produces flexibility. A two-pound steel ball dropped from a height of four to eight feet causes the glass to yield as a net would give under the same impact. The glass cuts easily with a glass cutter and a safety razor blade. For the windows of automobiles, busses, trains and the home, the flexible glass is introduced as a safety factor, eliminating the hazard of flying glass in accidents.

Demonstration of New Safety Glass; Right, Showing Effect of Steel Ball Dropped on the Glass; Below, Sheet of Glass under Load Has Appearance of a Net



POTASH IS EXTRACTED CHEAPLY WITHOUT USE OF FUEL

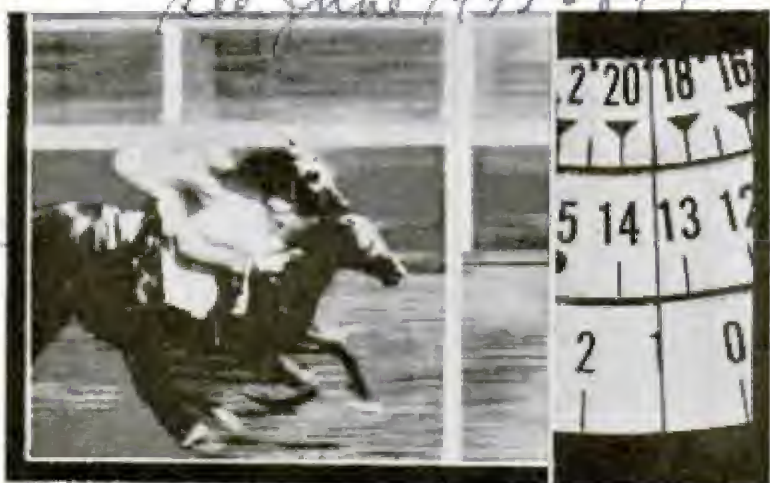
Potassium chloride, an important ingredient in fertilizers, can be produced inexpensively now by a method which does

not involve the application of heat or the use of any fuel. Engineers of the federal bureau of mines found, that on crushing the crude potash ore, it is possible to separate the potassium chloride from the sodium chloride or common salt, which comprises only per cent of the potash, by adding a substance which produces a film over each particle of the former but does not film the latter substance. This film has adhesive properties, causing the potassium chloride particles to stick together. With agglomeration, separation on shaking tables becomes effective and virtually pure potassium chloride is produced. By this method, a product consisting of ninety-five per cent potassium chloride is obtained.

*Sept. 1 Interior release
10/17/35*

Camera-Timer Picks Winner at Race Track

see June 1935 - 874



Top, Two Views of Close Finish of Race with Time Shown at Right; Bottom, Photo-Timing Equipment

Confusion over the winning horse in close finishes is eliminated at a California race track by an electric timing camera. The device combines accurate timing in hundredths of a second with high-speed photography that takes motion pictures of the finish and of the timing clock simultaneously. The developed print shows the runners at the finish of the race at the ratio of one frame to every four inches of their progress and their time in hundredths of a second on every frame. One

feature of the system is high-speed development of the film. By means of a special emulsion, prints can be placed in the judges' hands by the time the jockeys have finished weighing in. The print used by the judges for determining the winner can be projected upon a screen or posted for inspection. The timing system records the time at every quarter of the race.

8233

LOCAL FEVER IS INDUCED BY RADIO WAVES IN TREATING DISEASE

For several years artificial fever has been induced in the human body by short radio waves for treating certain types of disease. Hitherto, however, the fever has been induced in the patient's entire body although only one part of the body may have been under treatment. A London doctor has developed a method for inducing a localized fever applying only to the area being treated. He interposes a cylinder of wax and ebonite between the radio generator and the patient, localizing the heating effects of the radiations and producing a rise in temperature only in one particular part of the body.

June Service of 23/36

see Nov. 1934 654

8200

ANCHOR CHAIN LINKS LOCK BY DROP FORGING

Greater strength is imparted to anchor chain for ships by a new process that leaves each link drop-forged to shape and size. The link is made of two sections, one of which is heated before the cold section is inserted. The joint is struck in a forming die, locking the extra metal of the heated section around the cold lugs of the other section. The resulting stud is formed as a part of the link, not a separate piece, increasing strength.



Baldt Anchor Chain & Forge Co. 6 H and

Western Electric Co., 145 Broadway, New York

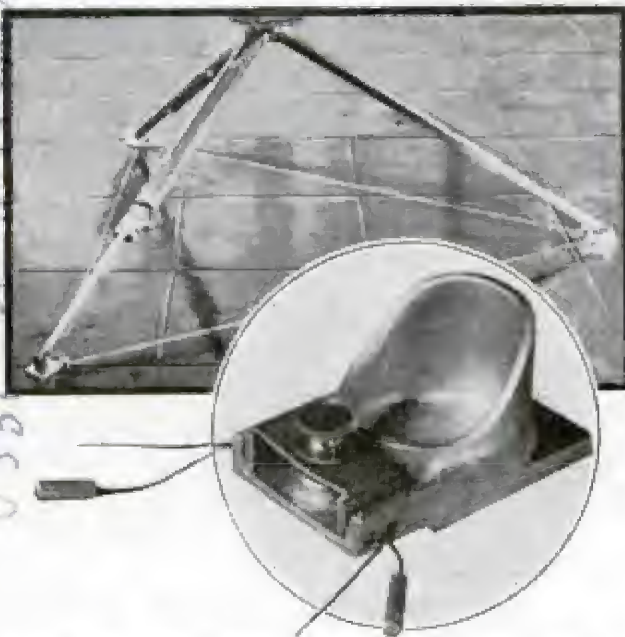
Santa Anita

Dr. J. J. O'Connell, 1200 12th St. N.W., Washington, D.C.

Butler, Chester, Pa.

NON-SLIP CAMERA TRIPOD BASE IS EASILY ADJUSTABLE

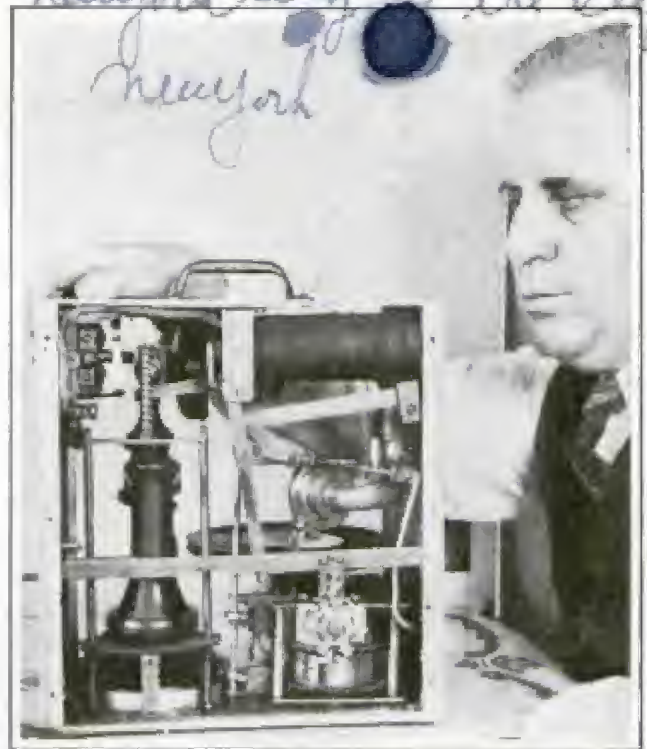
For setting up the camera or survey instruments on slippery or irregular surfaces and sloping platforms, a new tripod base is adaptable to almost any position. Each leg may be adjusted separately or the three legs may be moved as a unit without altering the relative position. The base is particularly useful to the photographer when it is necessary to operate the camera on wet or highly polished surfaces. It is lightweight and occupies little space when not in use.



Tripped on Latest Non-Slip Base; Inset, One "Foot," Showing Means of Adjustment

ALARM REPORTS FIRE BY PHONE AND TELLS LOCATION

Automatically dialing the operator, an inexpensive alarm with a "voice" reports fires by telephone, giving the location and repeating the alarm any number of times desired. If located at that spot, the alarm might operate in this manner: "I want to report a fire in room 500 on the fifth floor of 425 Fifth avenue, which is on the southeast corner of Thirty-Eighth street." When firemen arrive at the building, they are guided to the fire by illuminated signals and the sound of a gong. The device has a small fireproof metal container in which is mechanism controlled by thermostats. Heat actuates the thermostats. There is no actual connection to the telephone lines, the device using the phone in



Apparatus That Telephones Alarm; Note Phonograph Arrangement That Provides the "Voice"

the same manner as a human being. The voice is a phonograph with metal record giving complete audible instructions through a miniature loud-speaker set near the telephone. The alarm is portable.

BIRD FAMILY LIVING IN A SPOON IS SNAPPED BY CAMERAMEN

Plenty of room for the whole family has been found in a teaspoon by a humming bird mother. So tiny are her newly hatched babies that the teaspoon gives the mother space in which to care for the little birds. Dr. C. W. Leister of the Bronx Zoo and Dr. A. A. Allen of Cornell university snapped this remarkable picture.



Mother Bird with Tiny Babies in Spoon

8,132.

TIPS on

c/o Chicago Tribune, Chicago



Left, Ready to Match Wits with the Big Ones; Below, Note Position of Reel and Thumb in Making Cast



By BOB BECKER

MANY are the ways of presenting a lure to a hungry fish, but the singing reel and the flashing rod of the bait caster provide better sport than just sitting patiently in a boat and waiting for a fish to come along. Anybody can fish with a cut pole, but anyone who has dodged the wildly flying hooks of a novice knows there is something to be learned about the enjoyable art of bait casting.

Let us first consider the proper equipment. Rods vary from the stubby three-foot ones for trolling or use on small streams, to the six-footers, but for most uses the five-foot rod is best. Rods are light, medium, or heavy, and constructed of bamboo, rolled tubular steel, hollow tu-



bular steel, or solid steel. The bamboo rod appeals because of its beautiful wrappings and the painstaking handiwork that goes into its construction. It combines appearance with balanced lightness and lots of action. Next comes the hollow tubular-steel rod with action like bamboo. The solid steel also is a good casting rod.

Light rods are for tournaments, or for use on bass and pike, medium for most purposes, and the heavy ones are for going after the big fish. Reels can be selected to fit your pocketbook. The beginner can get started by spending only four or five dollars for a reel. However, much of the suc-

BAIT CASTING

Right, the End of a Hard Struggle; Below, Position for Back Cast and Proper Manner for Holding Rod and Reel When the Line Is Running Out; Note the Position of the Thumb on the Reel during the Two Operations

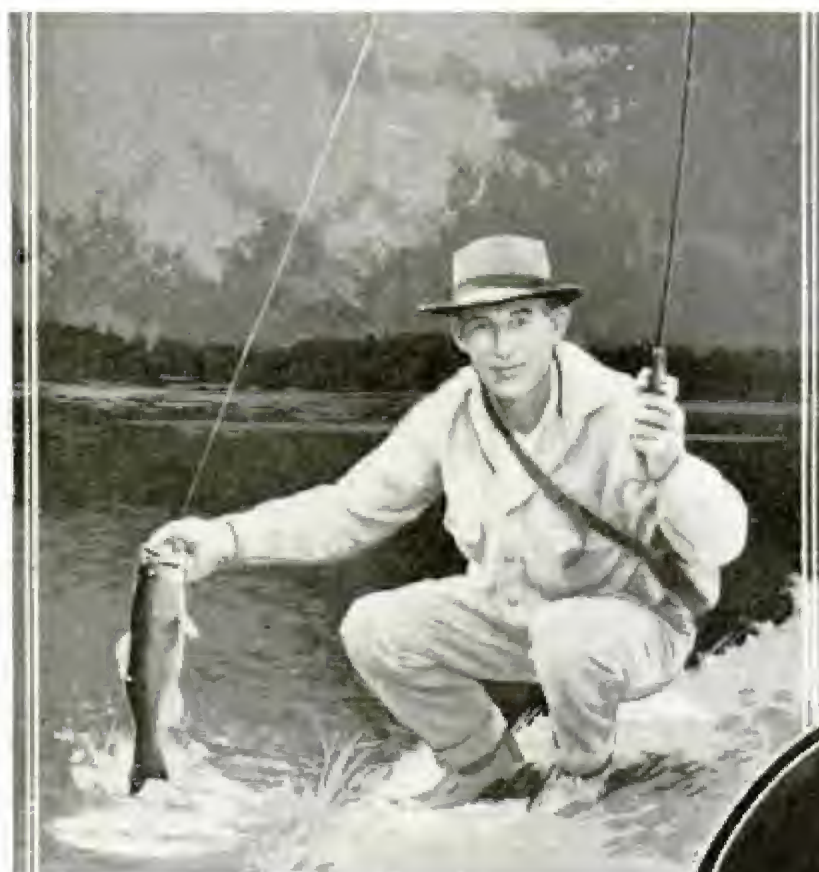


ner because the little gadget that lays the line evenly on the spool is a big help. The beginner also will find the anti-backlash feature a help. This keeps the spool from over-running and snarling the line. After the fisherman has learned how to cast and has received some helpful coaching from a veteran, he can forego the anti-backlash feature.

The choice of a line depends on the kind of fishing. For general all around fishing the beginner will find a light line is best. A line testing

cess of casting rests in the behavior of a reel, so don't attempt to learn the game unless you have a reel that is in good order and runs smoothly.

A level winder is recommended for the begin-



around fifteen pounds is heavy enough and casts easier. You can buy braided silk lines that are "natural" or waterproofed. The chemicals in lakes and streams do not attack a waterproofed line as quickly as one not treated, many fishermen believe. Others will use nothing but a natural silk, a good example of the differences you will find among some 10,000,000 fishermen regarding equipment. You also will want some short wire leaders. These go between the end of the line and the artificial lure because some game fish have teeth that can cut a line.

Now you are ready for a tackle box and some lures. There are scores of beautifully painted and intriguing artificial lures and the beginner should have an "adviser" to point out the differences between them. Surface lures which dance and skitter on the water are very deadly for certain kinds of fishing. Then there are semi-surface lures which work a short distance under the water when retrieved. These usually have attractive movements, diving and darting about. There also are deep-diving lures that bore into the water, for use when the fish are staying pretty deep. You have a choice of lures made mostly of wood, metal lures and metal and wood

combinations. There are ingenious lures that can be used with strips of pork rind or cast without them. All kinds of whirling blades and spinners sometimes are a part of these metal lures.

There are lakes and streams demanding weedless lures, and others where you don't need them, so you should have at least a few of each kind.



Position of Hands for Reeling in, and Black Bass Taken on a Bait-Casting Rod

After experimenting for years, I have what I call the "go light" assortment of lures. First, I have a wooden lure which zigzags, wabbles, and wiggles from side to side when reeled in. When not moving, it floats. It is white with red head, perch finish or silvery and must be worked in jerks.

Next, the log-riding lure. Many lakes, ponds, and rivers are filled with logs and snags. Big fish hide among such snags. One must cast every hole in this cover. Therefore, you need a non-fouling lure that will slide over branches and logs. The suggested lure is a red ibis fly with small spinners set above the hook to act as a

guard. Add a strip of pork to make it more attractive.

Third, a spoon or spinner and bucktail fly combination with a weed guard. This is a weedless lure. We must have a good weedless because fish like weed beds. Add a pork strip for additional attractiveness.

Next, a jointed imitation minnow with a metal mouthpiece. Looks like a fish, dives like one



Correct Position When Casting for Target; Above, Bob Clarkson, Who Made a Ninety-Nine Score in Casting a Five-Ounce Accuracy Bait, Looks over His Reel

and is for casting when the shoreline is clean of small weeds.

Fifth, a wooden surface lure with or without spinners. Something to "plunk" on the water and then twitch and juggle to make the fish believe it is injured. This is a good example of how you sometimes can fool a fish by thinking like one.

Last, a metal, deep-traveling lure of some type. Add a pork strip. Use this over submerged weed beds for the big ones. A big game fish strikes as much through bad

temper as through hunger. So in selecting some surface lures, think about noisy, splashing action.

Now we come to the how of bait casting. Underhand, or sidehand casting is not only dangerous but inaccurate. All records, both for distance and accuracy, have been made by using the regular, overhead cast. First, select a mark at which to shoot, the edge of a weed-bed, or a little patch of water between two logs. Now, knuckles up, reel

crank on top, standing or sitting in a comfortable position so you face your target, point your arm and the rod at the target. Don't get that shoulder ready for action. You won't need any big muscular effort.

Next, bring the rod close to the face by bending the wrist. As the rod moves upward, the palm of your hand will arch up and the reel crank will point at the bottom of the boat. Keep your thumb firmly on the spool of line, and your eye on the tar-

(Continued to page 132A)

SAGEBRUSH DISTILLED TO MAKE HIGH EXPLOSIVES



Apparatus Used for Distilling Sagebrush; the Weed Yields Valuable Products

By a new distillation process, sagebrush can be converted into valuable products, including camphor, oil for medicines, and pinene, a constituent of turpentine. C. R. Kinney, of the University of Utah, who perfected the process, also is seeking a way to convert the residue brush into a palatable fodder for sheep. The camphor taken from sagebrush can be used in medicinal products, disinfectants, celluloid and high explosives. At present, much of the camphor in the United States is imported from Japan. The western plains of this country are covered with sagebrush.

COPPER MADE IN LIQUID FORM IS APPLIED LIKE PAINT

Copper in liquid form can now be applied as a protective coating like paint. A process has been discovered for reducing the metal to a finely powdered, non-crystalline form which, when mixed with a special carrier, yields a material which is virtually liquid copper, more than ninety-eight per cent pure. The typical crystal form of copper is broken down by the process, the small particles remaining in suspension in the carrier and packing

tightly together on application so that no small gaps appear. Tests indicate the liquid-like copper should have a useful life of five or ten years. It is highly resistant to acids and other forms of corrosion and retains copper's natural electro-chemical affinity for other metals. The air and water tight carrier excludes the elements so that electrolysis does not occur, it is claimed. The product is expected to prove particularly valuable in marine use and as a covering to protect wood against destruction by termites and barnacles.

MODELS OF HISTORICAL BOATS MADE BY EXPERT BUILDER

One of the expert builders employed by the Smithsonian Institution is a "preparator" who makes scale models of the historical pieces displayed there. As a boy he began whittling odd toys and useful objects and today he reproduces anything from an early American steam engine to a model of a sailing vessel. One of his latest



Expert Model Maker for Smithsonian Institution Working on Scale Model of Early American Vessel

pieces is a model of the "Baltimore Clipper" of the period of 1820, complete to the tiny planks in the decks and hatchways.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Nichols Copper Co.

Life Belt Illuminated by Contact with Water



Night Rescues at Sea May Be Facilitated with the Aid of an Automatic Light Recently Designed for Life Jackets, Buoys and Lifeboats; This Light Flares Up as Soon as It Comes in Contact with the Water, Marking the Location of Survivors in the Confusion of Shipwrecks at Night; the Light Is Operated by Electrolysis, the Water Serving as an Activating Agent to Generate a Current from the Electrical Potentials of Separated Bars of Carbon and Zinc in the Light; Small Lights Are Used for Life Jackets, and Larger Ones for Buoys and Boats.

Inv. Isunnar A. J. Wenckler

791 Tremont St. Boston, Mass.

MASK GUARDS FACE OF RIDER ON RACING MOTORCYCLE

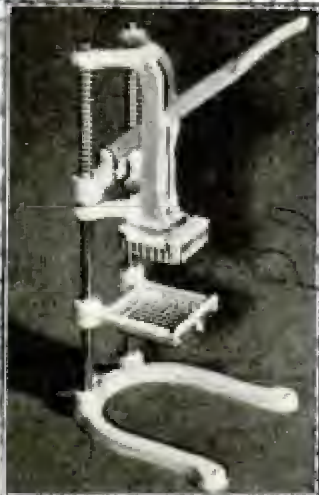


Wide Wared
Demonstrating How Shield Offers Full Protection for Face; Ventilation Is Provided

one for auto driver / Mesa Brown Bros / 20. Great / Eastern / London
Complete protection of the face against the rush of wind is afforded by a mask designed for automobile and motorcycle operators. The mask shields the entire face and is rounded in accordance with accepted principles of streamlining. It is particularly useful to the rider in motorcycle races, since it serves the double purpose of goggles and face protector. A special ventilating compartment permits the wearer to breathe comfortably.

KITCHEN AID SLICES POTATOES OR CUBES VEGETABLES

£. 22 2
Potatoes can be sliced for French frying or vegetables can be cubed for soup and salads by a new kitchen appliance that

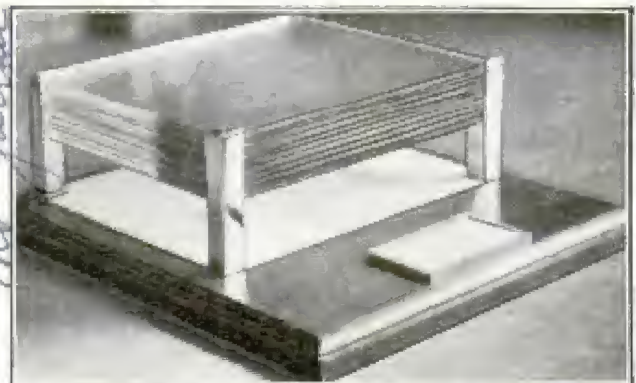


Richy Carter / Kitchen Aid / does the work fast and neatly. Three sizes of knife panels are available. The machine is operated by pulling down on a handle, forcing the knife panel through the potatoes or vegetables resting on a block below the knives. The slices or cubes fall into a dish be-

c/s Clayton Daily News / Clayton Ohio
neath the appliance. Three screws attach the device to a table. Made of stainless steel, the knife panels are easy to clean.

MAP TRACED ON GLASS PLATES GIVES RELIEF EFFECT

£208
Three-dimension maps are being produced on plates of glass by the U. S. army air corps for student pilots to study hills, valleys and flat areas. Preparation of the maps is easy. Taking a contour map with lines indicating the various levels, the student lays a plate of glass on the area of which he desires a relief map. First, the lines showing the lowest level, perhaps 100 feet above sea level, are traced on the glass in ink. On a second plate are traced the lines marking portions 200 feet above sea level, and so on, until the last plate has been traced with lines showing hilltop and mountain-peak levels. By superimposing the plates in order of their eleva-



Bottom, Tracing Relief Lines on Glass; Top, Stack of Plates Makes Up Complete Map

Badger Ave. Newark
tion, the effect is a map with depth as well as width and length. The plates may be used repeatedly by wiping off the ink lines with a damp cloth.

There were 8,322 licensed and unlicensed aircraft registered in the United States and its possessions in 1934.

Air Commerce Bulletin

Airplanes Speed Rich Fur Cargoes to Market



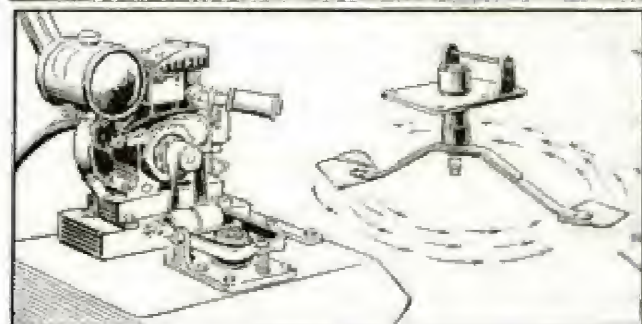
Bales of Valuable Furs Ready for Loading into Plane Floating Beside the Dock; This Method of Shipment Speeds Delivery to Market When Best Prices Are Obtainable

Furs, the "currency" of the far north, are being transported swiftly to the world's markets by airplane. All across the barren wilderness, pilots drop down on small trading posts, load the bales of costly furs and rush them to the nearest railroad for fast shipment to the fur marts. This rapid transit enables the trapper to offer his catch when prices are most favorable. Thus, instead of waiting weeks, and sometimes months, for his money, the trapper can convert his catch into cash quickly. One recent shipment contained more than 2,000 white-fox pelts.

tank holds fuel sufficient for six to eight hours operation. Mowing capacity is three to four acres per day.

ROTARY-BLADE POWER MOWER CUTS GRASS CLOSER

Closer cutting of grass and weeds is possible with a power lawn mower equipped with blades that revolve around a vertical shaft. The blades, placed at an angle to produce scythe action, are attached to a horizontal cutting arm that is turned at high speed by the shaft. A hood covering the cutting arrangement creates an upward suction that tends to lift grass and weeds, resulting in smoother cutting. The mower is powered by a four-cycle, one-cylinder, air-cooled gasoline engine. The



Top, Rotary Mower in Use; Bottom, How Blade Is Driven in Horizontal Rotary Direction

Sold by Southern Specialty Sales Co. New Orleans, La. 821 St. Charles St.

Whitcomb

Lawn Mower Sales

Indianapolis

Com. Thomas G. Blumenthal

10555 Holman Ave

Los Angeles
Calif

TRAINING

Dollar Line: after steamship companies having mail contracts.



amount of mail carried. This means that serious-minded young men who choose the sea for their profession may be boosted up the ladder to success in a few short years instead of laboriously working their way up from the fo'castle, and at the same time receive pay while they are training. Many of the masters of America's crack ocean greyhounds also received their first training as sea cadets under earlier laws.

"In the days of wooden ships cadets usually had to pay for their training," says one sea captain. "Boys went to sea in their teens and sometimes became officers in their early twenties. These days responsibilities on the sea are greater and

TODAY, a youth just out of high school is at the wheel of a passenger liner steaming past Gibraltar, another is pacing the bridge of a freighter bound for Pago Pago, and a third is directing seamen in loading cargo at an obscure Chinese port. In many parts of the world other American boys dressed in officers' uniforms are standing watches and helping to run ships. They are the new seagoing cadets, the future officers of the American merchant marine.

Seeking a steady supply of high-caliber young men to officer its ships and believing that it is wise to train young officers in the types of ships they eventually will command, the government provides in the Jones-White act that every American vessel awarded an ocean mail-carrying contract shall also carry one or more cadets who are to be trained at sea. Some ships carry three or four, depending on the



Cadet Raising Flag on Ship and Listening to Explanation by Officer of Points of Compass Card

Young SEA DOGS



Above, Cadet Receiving Instruction in Steering and Concerning the Use of Flag Signals; Below, Officer Explaining the Mechanism of the Automatic Steering Gear and a Cadet Learning How to Take Sights with the Compass under Direction of an Officer



the training is more thorough. Since the mails usually are carried on the newest and finest boats, cadets receive their training on the very finest ships afloat."

On most ships the cadets eat and work with the officers and learn the secrets of seamanship at first hand. The personal instructions the officers give amount virtually to private tutoring and as a consequence the cadets learn their work thoroughly. Right now, on the Grace intercoastal passenger liner, "Santa Rosa," Captain Curt Zastrow is preparing to "graduate" both of his cadets. One of them, having served nearly three years, is ready to take his examination for a third mate's license. The other will take his examination next fall. Then the line will employ them as junior officers on the smallest vessels where their advancement will be more rapid. Step by step, they will



Above, Officer Explaining to Cadet How Courses Are Laid Out and Cadet Using Deck Telephone; Below, Cadet Learning Location of Fire-Alarm Stations

become second officers, first officers, and finally captains. The captain of a sister ship to the "Santa Rosa" went to sea as a cadet in 1915 and has been a full-fledged captain now for eight years.

Each steamship company selects its own cadets. Most lines require that applicants be between eighteen and twenty-one years of age, in good physical health, and have a high-school education, or its equivalent,

including the fundamentals of algebra, plane and spherical geometry, plane trigonometry, and the use of logarithms. That mathematical training is necessary for studying navigation. Cadets provide themselves with one blue suit and several white uniforms as well as a khaki uniform, jersey and dungarees. During their first year they receive \$30 a month, with a ten dollar a month raise each year for the two remaining years.

During the first trip they usually are given petty tasks to accustom them to the routine. On the next voyage, they settle down to hard work under the eyes of the officers and spend part time working as ordinary seamen, scrubbing decks, polishing brass and handling paint brushes. During the first few voyages they are assigned to the different duties of the deck department and learn how to moor the ship, rig cargo booms, and handle lifeboats. They are taught the method of coming to anchor, how hatches are raised, and the care of cargo gear and deck machinery.

Each cadet is given text-book assignments and personal instruction. Once a week on most ships the students are tested in such subjects as rigging, marlinspike seamanship, duties of lookouts, the compass, log and lead, and piloting. They study at odd hours because the day's schedule is full. A cadet may be called at four in the morning to stand watch with the officer on the bridge until daylight. Then he polishes brass, knocking off at eight o'clock for breakfast and remaining below to sleep and study, being called again at four in the afternoon for other

(Continued to page 126A)

FIGURES SCULPTURED IN GLASS BY HOME CRAFTSMAN

Table ornaments are modeled in glass by a method developed by a Fort Worth, Tex., man which offers many possibilities for the home craftsman. His only tools are a pair of glass tweezers, a torch with gas and oxygen connections, and a drum of oxygen. He uses lead glass in various sizes and lengths, heating it with the torch until it becomes sufficiently pliable to mold. Pieces are also welded together by heating them simultaneously. By stretching, bending and welding the glass such figures as



Using a Torch to Mold Small Figures of Glass and Some of the Table Ornaments Made of Glass

miniature elephants, alligators and birds are made as well as tiny vases, golf clubs, and candlesticks. More pretentious models include a ship encased in a bottle and a bird trapped in a globe.

PISTON RINGS FITTED BETTER BY CIRCULAR FILER

Any size, angle or style piston ring can be fitted better by using a circular file that speeds up the mechanic's work. The rotating file is arranged to file both ends at the



same time to exactly fitting faces. By removing the top fixture, the mechanic has a practical circular saw for sawing expansion slots, in aluminum alloy pistons. The

filer can be bolted to the engine block, placed in a vise or fastened to the bench. After setting the top guide, the mechanic simply inserts the ring and turns the crank.



Artist with His Carving Depicting Courtroom Scene; Note Skill with Which Each Character in the Group Is Presented in Caricature

CARICATURES CARVED IN WOOD HELP BUILD A BUSINESS

Whittling blocks of wood into caricatures of cowboys, Indians, horses and other subjects has been turned into a successful business by Herbert Anderson, former Colorado cowpuncher. A gifted caricaturist, Anderson made his carvings for amusement but they now are in demand in Hollywood studios. One interesting piece of work is a courtroom scene, showing the judge asleep, the jury box and a witness being cross-examined by attorneys.

PHONE WIRE SPEEDS UP SOUND ALMOST TO LIGHT'S PACE

Speeding up sound almost to the pace of light, a new telephone wire permits ultra-fast passage of signals. It is capable of concentrating within a half-inch channel a

band of million cycle electrical energies which hitherto have needed open air and radio waves to escape interference. The wire is a hollow tube with a solid wire inside, insulated from each other largely by air. The double wire uses the "skin effect," the fact that electricity likes to travel on the outside of a wire. The million cycle frequencies travel on the outside of the inner wire and the inside of the outside tube. The wire promises to be the television, picture and music wire of the future.

PNEUMATIC TIRES ON CIRCUS WAGONS SAVE PAVEMENTS

Many cities object to the damage done to pavements by the heavy wagons used to haul the equipment from the trains to the show lot when the circus comes to town. As a result, one circus has taken a lesson from the automobile industry and equipped all its wagons with pneumatic tires. Despite the automobile wheels, however, horses will still furnish the motive power.



Circus Wagon Equipped with Pneumatic Tires

Com. Harry A. Atwell
64 W. Randolph

Chicago Tribune
1/23/25

North Hollywood, Calif.

Especially and
M. E. Strubey Bell

Telephone Laboratories, 463 West 41 Street

Mingling Bros and
Barnum and
Barley

Recorder Shows Electric Currents of Brain

Changes in electricity in the brain promise to permit doctors to probe painlessly into brain processes in much the same way heart action is now studied by graphic records of the electric currents emanating from heart muscles. Pieces of metal attached to the head pick up the currents. The instrument which records the electrical changes looks something like a radio and is a vacuum-tube amplifying system which magnifies the brain waves so the enhanced current can operate an oscillograph, which writes in light on a photograph a wavy line corresponding to the fluctuations of electricity in the brain. Changes in size of the larger waves appear under the influence of various factors such as anesthetics, stimu-

Right, Subject Ready for Brain-Current Test; Below, Wavy Line Shows Current



Midcontinental Airway between Los Angeles and New York. If satisfactory, the system will be installed on other trunk line airways. Pilots will practice in both good and bad weather without passengers. The system includes a radio compass, a radio receiver which flashes a light when actuated by the signal of a radio marker beacon on the ground, a sensitive altimeter and a directional gyro, together with the

lation of the sense of sight or hearing or work on a mental problem.

BLIND LANDING RADIO SYSTEM

Service tests of the U. S. Army's blind landing radio system will be made on the

usual flight instruments. On the ground are two radio stations transmitting on different frequencies, one station about 1,500 feet from the airport and the other about two miles. Signals from the stations guide the pilot to within 150 feet of the ground over the station near the airport boundary.

U.S. Army, Bureau of Air

MILE-A-MINUTE



The "No-Yac" at Speed, Showing How It Rises in the Water, and a View of the Under Side

ocean greyhounds. Airplanes are setting new speed marks. Streamline trains are establishing new records and more miles per hour are being built into automobiles. To my mind, however, the thrill of thrills for the fellow who loves speed

promises to be mile-a-minute outboard motorboat racing.

Traveling at sixty miles an hour in a tiny craft only a few feet over-all, you have a sense of lightning flight through the rushing of mighty elements in uproar—a thrill unobtainable in any other sport. And

By FRED W. McQUIGG

THIS is a speed year. Make 'em go faster is the demand for everything that runs on wheels or four legs, rushes through the air or skims over the water.

Nations are turning out bigger and faster

THRILLS *of the* WATER

W. Madison 7/30/31

7/30/31



This View of the "No-Vac" Shows How Thoroughly It Has Been Streamlined; Note How the Planing Surfaces Have Been Designed to Resemble an Airplane Wing Section

Boat owned by Kinkaid motor service - 5308

mile-a-minute speed for outboards is no longer a dream. After two years of testing, refining and racing, a new type of outboard boat, known as "No-Vac," has undergone unofficially timed trials which indicate crafts of this type can attain speeds of more than sixty miles an hour—and do it safely.

This craft has been streamlined so thoroughly that it might be compared to a skipping board with a motor attached. The designer, LaRoy Malrose, of Chicago, set out to build an inexpensive craft faster than anything afloat of comparable size. To overcome vacuum, he built a hull like an airplane fuselage, flat and narrow, with a stern barely wide enough to accommodate the motor. This part of the design

was intended to eliminate the vacuum behind the pilot's body and behind the motor. To overcome vacuum behind the step, he constructed planes triangular in shape, decreasing the area of wetted surface and cutting down water resistance.

At first the designer had trouble getting a driver to enter his odd looking boat in a race. It was such a radical change from the conventional design that fear was expressed as to whether it would work at all. Finally Ralph Harrington, well-known racer, entered it in a contest as a last resort, after having cracked up his outfit.

"I know I am in for a ducking," he said, "but I just can't sit here and look on. Do you really think this thing will stay right side up?" He took the lead on the very

Does not answer letters left this publisher - no plans

C. Eckland, Jacobsen Associates



24 M.P.H.

CLIPPER SHIP



31 M.P.H.

MODERN
LUXURY
LINER

43.5 M.P.H.

MODERN DESTROYER



58.82 M.P.H.

OUTBOARD
MOTORBOAT
RECORD

124.86 M.P.H.

GAR WOOD
MISS AMERICA X

Going Places in the "No-Vac," Details of Hull Construction and Drawing Showing How Speed of Watercraft Has Increased

first turn and held it all the way for a win by a city block. Since then he has won six races and one second with the boat he thought could not stand up.

Fans saw the "No-Vac" perform at the Century of Progress in Chicago while the William Randolph Hearst race was being held. An army of the best drivers in the country were competing. Jimmy Rogers was in the "No-Vac" for the first time. Three firsts and one second in the four races entered is the record he hung up. That made Rogers the high-point winner among the professionals.

The log of the "No-Vac" to date shows nine firsts and two seconds, it never having been out of the money. One of its advantages over boats of conventional design is that it can take turns wide open without capsizing or weaving. As a matter of fact the tests show that it is almost impossible to turn the boat over. It handles with a class B. C., or 460 motor, and rides high in the water—in fact just about out of the water—presenting the appearance of being suspended in the air from stem to stern when at full speed.

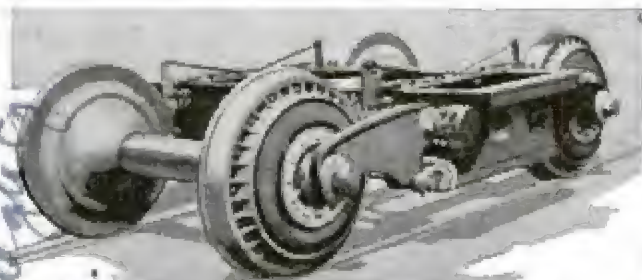
The hull as a whole is very compact with an unusually narrow cockpit so the driver can brace himself on the sides. Dimensions for Class C are: nine feet and four inches long, and

four feet and eight inches beam. The planing surfaces are extended from the cockpit and patterned in the profile much like an airplane wing section. The forward planing surface is only twenty-eight inches wide, and thirty-six inches long. The rear planing surface is thirty-eight inches wide, and five feet long. The transom is very narrow, only thirteen inches wide, and thirteen and one-half inches high. It is constructed of laminated oak.

The "No-Vac" is built much the same as the conventional boat. A jig is constructed and notched to receive the different sections which are built up separately. Battens and stringers are glued and screwed to frames after which the whole craft is covered with plywood, making a very light and strong job. The craft rides level and not on the forward plane which touches the water only occasionally to give rear surfaces the correct planing angle.

RUBBER TIRES INSIDE WHEELS ABSORB RAIL BUS SHOCKS

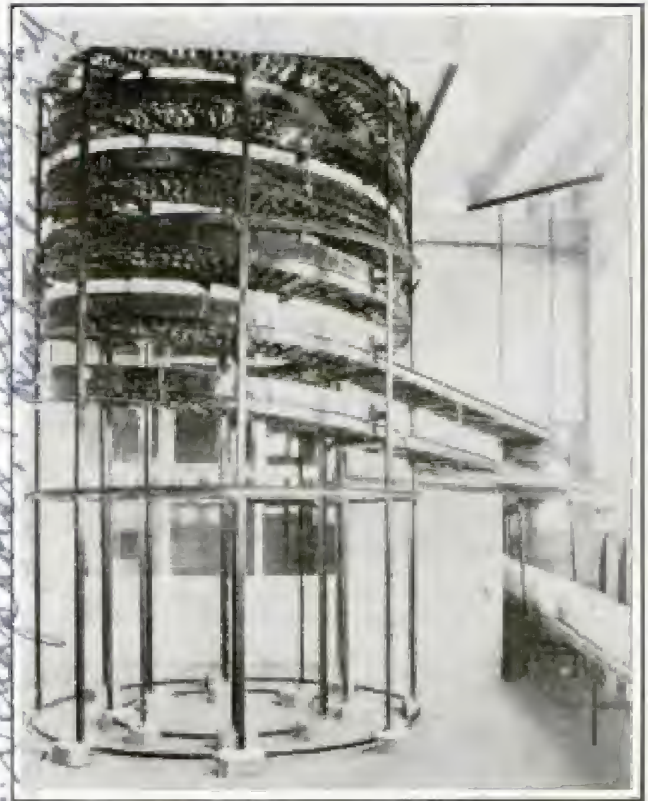
Easier riding is imparted to a new Austrian railroad bus by fitting rubber tires inside the steel wheel on which the vehicle runs. The wheel is drumlike, offering sufficient space for the inflated tires which bear the whole load of the car and which



Top, Trucks of Latest Rail Bus; Bottom, Showing How Tires Fit inside the Wheel

absorb shocks. Exhaust silencers are carried on the roof. Fuel and water tanks are beneath the car, which weighs seventeen tons and can go ninety miles an hour.

DOUBLE SPIRALS ON CONVEYOR SAVE TIME AND SPACE



Conveyor with Double Spirals; Note the Double Outlets That Deliver Greater Load

Designed with double spirals, a new conveyor speeds up loading or unloading operations, in addition to saving space. One spiral may lead to the truck-loading platform and the other to the car-loading platform, loading at both points going on at one time. Or, both spirals may lead to one destination, delivering a double load.

YOU REST BETTER FEET FIRST WHEN YOU TRAVEL

When you recline while traveling, you will rest better if your feet are pointed in the direction of travel. This conclusion has been reached by the operators of a fleet of ambulances in New York although passengers in sleeping cars have been riding head first for years. The head-first mode of travel, the New York investigators claim, had its origin in the days of poor ventilation when the passenger sleeping feet first would have had his head exposed to drafts and soot. Riding feet first, it is claimed, eliminates car sickness of the type caused by sitting backward, reduces congestion of blood in the head and the probability of injury to the head in the event of accident.

Austro-Claimerworks According to

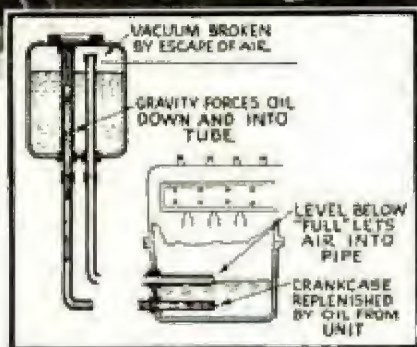
Cont. Hays Jr. Kutzschbach malthestrasse 2, Berlin-Steglitz Germany

Cont. W. J. Schabert 45 Academy St. Chicago, Ill. 2/18/35

258 W. 69th New York

Used at Esensee Brewery Rochester N.Y.

AUTOMATIC CRANKCASE OILER MAINTAINS OIL LEVEL



Top, Where Oiler Is Installed; Bottom, Principle by Which Oil Is Kept at Proper Level

Automatically maintaining the oil level in the automobile or truck crankcase, a new oiling device is said to reduce operating costs. The oiler, by keeping the crankcase exactly full at all times, prevents overheating caused by a low level and reduces carbon formation and fouling of spark plugs caused by excess oil. Installed on the motor side of the cowl, it is connected to the crankcase by two flexible pipes. It operates entirely by the laws of gravity, atmospheric pressure and vacuum.

POCKET REGISTER FOR SALES



As a substitute for the usual sales book or pad, an autographic register which fits the pocket is being produced. It is made of aluminum and is always ready for use since

a flip of a lever brings a fresh set of forms in place. It is not necessary to change carbons or to interleave each new set of forms. The recorded sheets are kept in a special compartment in numerical order.

LATEST STYLE LOG CABIN IS CHEAPER TO BUILD

Log cabins, homes of the pioneers, are providing the government with the inspiration for new, low-cost, picturesque types of dwellings. Home designers at the United States forest products laboratory at Madison, Wis., working with the Rural Rehabilitation corporation, have evolved a log cabin which can be constructed simply and of inexpensive logs. Cheap second-growth timber such as northern aspen can be used. The logs are split in half, allowed to season for several months, then peeled and treated with a chemical preservative to prevent rot and attacks of insects. Walls are built with the logs set vertically, preferably on a concrete foundation. The flat split surfaces are set up to face each other, each surface overlapping on half of two opposite surfaces. The logs are then spiked together. Such walls have high qualities



Model of Log Cabin Made by Splitting the Logs in Half and Setting Them Vertically

of durability and rigidity. Virtually any size of logs can be used and insulation can be placed between the flat surfaces.

Germany is producing synthetic asbestos made entirely from domestic raw materials.

Antographic Register Co.

8/24

Contr. Charles A. Nichols,
433 Kensington Ave
Buffalo, N.Y.
POPULAR MECHANICS 685

Home Operated and Decorated by Electricity



Top, Button Beside Bed Opens or Closes Window in Modern Home of Buffalo General Electric Company; Above, Illuminated Fish Bowl Set Flush with Paneled Wall; Right, When Visitor Steps on "Welcome" Mat, Side Panel Lights Are Turned On; Pressure on a Button Shines a Small Spotlight on the Keyhole



Above, Ceiling Pattern and Dummy Window, Both the Result of Light Decoration

Washington and, Seneca Sts

SNOWMEN Battle



Running a Base Line in Connection with Snow-Measurement Work in National Forest in Colorado

To compensate, in part, for this expected continuation of dry weather, every foot of snow reaching the "high-level" areas is to be utilized by the government snow service. There will, accordingly, be more water available in our streams during the summer than there was in 1934, and losses to agriculture are expected to be reduced. The government, until late spring, will continue measuring all the snow falling on the higher levels.

Based on estimated snow-water runoff, federal workers are creating weirs, dams and basins to catch and hold the snow water for release into streams next summer. More than 100 snow-measuring stations are operating and for the first time, the high-level snow service has been extended to the mountains east of the Mississippi, as well as those to the west. We cannot afford to waste any snow water this year.

It may be that such snow as has fallen contains less moisture than usual, so while surveyors determine the extent and depth of the high-level mountain snow fields, other workers are taking the specific gravity of the snow to facilitate computations on the amount of moisture available.

DROUGHT conditions will not be ended definitely until next fall, according to Dr. George F. McEwen, of the Scripps Institution of Oceanography, who bases his prediction on oceanic areas underlying the characteristic paths of the air masses which traverse the North American continent.

Only enough weirs and dams will be created to slow up runoff for specified amounts of water.

As in the older irrigation districts, all new irrigation fields will be based on water apportioning. Not only will those who begin irrigating for the first time this year

the DROUGHT

*Canal Which Takes
High-Level Snow Wa-
ter to Desired Loca-
tions and Worker
Measuring Moisture
Content of Snow*



*How Much Water Is Contained in This Snow Field? The
Workers Are Measuring a Glacier to Obtain Figures for
Making an Estimate*

have to be content with their rationed amount of water, but hydroelectric plants which supply a large area of the country with electric light and power created with water power will likewise obtain only their just share of the available water in streams where levels are maintained by artificial works.

The snow service's work will be supplemented by thousands of new cisterns which have been built, as well as the many more thousands of artificial ponds dug by farmers and lined with gunnite and similar preparations to hold water. More than 1,200 wells have been located or purchased by the government, from which deep earth water will be available. But



Making Tests in Mountain Snow Field, and Snow Service Workers Breaking Camp in National Forest

it is to the snow service the government looks to keep water in streams.

Recommendations have been made for the improvement of the Platte river in Nebraska by diversion of Colorado river water, and for impounding in numerous reservoirs the water immediately available in the Platte valley, and for construction of similar reservoirs and dams in the upper Missouri region, and restoration of the water level of Devil's lake in North Dakota and the diversion of Missouri river water. It is safe to say diversions would only be effected after studies prove there will be

no deleterious effects to regions supplied by these water sources. Such effects can be prevented by getting the snow water under control in the areas which feed the Missouri and this is the job of the snow service.

Even on the government's own reclamation projects, the water scarcity in 1934 was so severe that farmers on the projects now plan to reduce the acreage of fall and winter crops requiring heavy irrigation. It is on these reclamation projects that government engineers learned what to do to give more summer water to the central states. In addition to other expedients, allotments have been made to enlarge the water-storage

capacity of reservoirs in Utah and elsewhere. In all, fifteen federal reclamation projects are faced with varying degrees of drought.

The department of the interior has announced that only an abnormally heavy winter rain and snowfall would prevent drought recurrence in 1935, and that a normal fall, while it would relieve agriculture in unirrigated sections, would not replenish the irrigation projects. It soon became apparent that the only way continuance of drought tragedy could be averted, would be by increasing the amount of the

Peter A. Buss Jr. 357

expected limited snowfall water meltage that could be held back and released to streams after the periods of the spring floods, which are not caused by the high-level meltage, but by the low-level meltage. It is this high-level meltage that is our permanent water supply. Every ounce of water in the Missouri-Mississippi river systems comes from this. Even wells are indirectly replenished from this source.

The men watching our high snow levels are the advance guard of as vital an operation as any nation ever employed to avoid distress. Moreover, because their work can be used in future years to avoid flood damage, on the same principle of getting control of water runoff in our watersheds, they serve a dual purpose, which only will be perfected some years hence when in moist years we use their control methods to avert floods, and in time of drought to maintain a steady water supply.

In some locations, particularly in parts of Idaho and Utah, where little glaciers establish themselves in the winter on high mountains, concrete channels have been constructed to lead off the meltage from the high levels to where it will be needed, instead of permitting the water to meander far from points of greatest need.

A peculiar situation has been created by the drought. If it is cyclical, and all but a very few authorities agree that it is, costly irrigation works will not be warranted, yet some safeguard must be established against the prodigious property loss during the dry cycles. If it could be taken for granted that a drought would last indefinitely, many practical measures could be taken for construction of canals and aqueducts to carry water to points where irrigation was to be practiced. But since it seems that droughts are actually cyclical, some economical expedient is being sought, like canals, from which farmers could draw off water in dry years, and use simple furrow irrigation, the furrows being made by simple use of the plow.



Builder with Large Model of U.S.S. "Houston" on Which President Roosevelt Took Vacation Cruise; It Was Constructed from a Photograph

MODEL OF PRESIDENT'S SHIP BUILT FROM PHOTO

Constructed entirely from a photograph, a model of the U.S.S. "Houston," used by President Roosevelt on his vacation cruise, has been completed by a Pennsylvania home craftsman. It is complete to two lifeboats, two motor barges, three motor launches and two seaplanes in position on takeoff towers. The model is lighted by using a six-volt transformer. Built of three-ply veneer and wood taken from packing boxes, it weighs about forty-five pounds. The miniature ship is ninety-seven inches long, fourteen and one-half inches wide and forty-nine inches high.

E-144.

BRAKE TESTER ON AUTO SHOWS STOPPING DISTANCE



Germany is experimenting with a brake tester which is attached permanently to the automobile and which shows the motorist the efficiency of his brakes at all

times. The tester measures the distance required to come to a stop after the brakes are applied at a certain speed. If the stopping distance increases, it is an indication that the brakes are less efficient than formerly and should be adjusted.

Martin Lane Bethlehem Pa.

many judging by the

Sepm 25 - Schuchert

629

Cont Joseph A. Bond,

Route 1, Box 23.

Briarcliff Manor, N.Y.

GOING



Without Modern Elevators Structures Like This Seventy-Story R.C.A. Building in New York Would Be Impossible

IT is estimated that 10,000,000 persons ride in elevators every twenty-four hours in the borough of Manhattan. More people travel vertically by means of lifts in the United States daily than ride in all our railroads, trolley cars, subways and elevated trains put together.

One day in 1852, Elisha Graves Otis, in New York, called in his friends and neigh-

bors to witness a demonstration of his "safety hoist." The hoist was run well up off the ground with Mr. Otis as passenger. With a flourish, Mr. Otis drew out a knife. "All clear below?" he shouted.

"All clear," answered his assistant. Otis reached up and cut the supporting rope. There was a gasp from the assembled gathering. The platform lurched downward. Then the safety spring engaged the ratchets on the guide rails and the car stopped.

Mr. Otis knew, as the engineers today know, that the problem of vertical transportation was not one of lifting and lowering passengers and freight alone, but lifting and lowering them safely. If the hoisting rope should break, as it often did, the hoist had to be stopped before it reached bottom.

To this problem Otis put his mind. Finally he hit upon the first simple safety stop. His car ran on crude rails. He fitted a spring—one similar to a wagon spring—beneath the top cross member of his hoist. To this he attached the hoisting rope. As long as the weight of the car was on the rope,

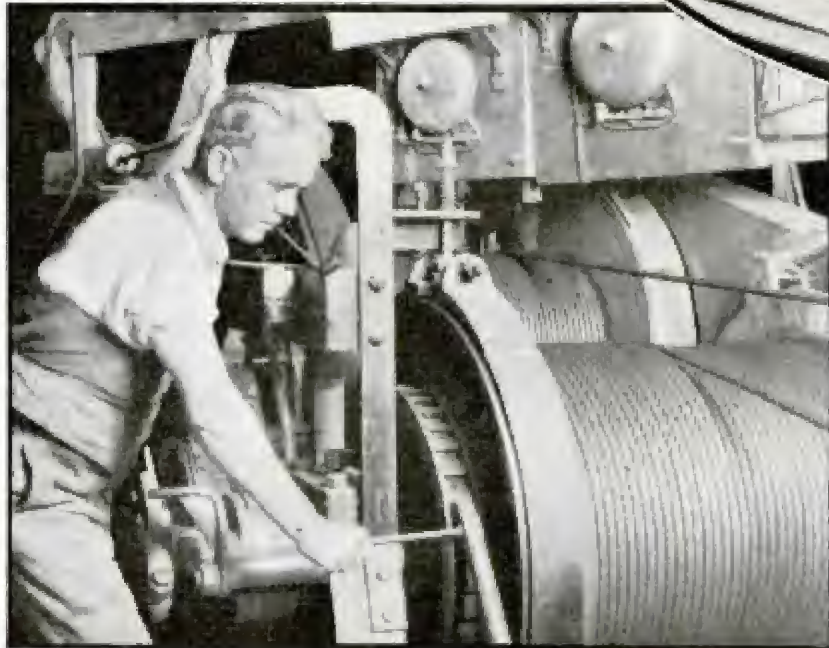
the spring was bent and shortened so it did not touch the guide rails to which he had fitted strips of iron ratchets. But the minute the weight of the car was off the rope, the spring extended, engaging itself with the ratchets on the guide rails and theoretically stopping the car. Sometimes it did and sometimes it didn't.

Today science has gone so far to protect

Otis Elevator Co.
260 - 11th Ave
New York City.

E-29

UP!



Left, Early "Safety" Elevator of Ratchet Safety Type and Steel Cables and Drums of a Construction Lift; Above, Elevator Used by Construction Men Before Regular Lifts Are Installed

patrons of vertical transportation that only one out of 243,000,000 passengers is killed. Even the photo-electric cell is used as a safety measure to protect passengers. As long as any part of a passenger or any garment interferes with a light beam play-

ing across the car door, it is impossible for the car to move.

Between Otis' first ratchet safety and the modern wedge-clamp brake, inventors and experimenters tried many kinds of safety devices. The air-cushion and the hydraulic were two moderately successful but expensive samples of their endeavors. The air-cushion was what its name implied. The lower portion of the hoistway was made air-tight. If a car fell, the air in this pocket cushioned the fall. The hydraulic plunger type presented an odd problem in safety. In order to counterbalance the weight of



the car and the long metal plunger, it was necessary to make the counterweight much heavier than the car itself. Consequently, there was danger that if the plunger broke, close to the bottom of the car, the car instead of falling would be yanked skyward. There are still many hydraulics in use, but they are practical for short hauls only. A hotel in Philadelphia has the highest hydraulic plunger elevators with 300-foot plungers.

The two factors having the most bearing on the development of the elevator as we know it today, were the adoption of the flexible steel cable and the perfecting of the electric motor. A New York inventor, Frank J. Sprague, saw the possibilities of using the electric motor for vertical transportation and originated the first electrically powered and controlled elevator which was the forerunner of the modern lift of today.

How significant this transformation was. Without it there could be no skyscrapers. There could be no such project as Rockefeller Center intended to house 200,000 persons. Great cities could never have been built in restricted areas. Modern horizon-

tal transportation has made it possible for these thousands of workers to scatter out into the suburbs, where living conditions are superior to those found in the cities.

Today because of the tenaciousness of the elevator engineers, it is possible for the 144 elevators in the Rockefeller Center development to empty it of its 200,000 workers in a few minutes over an hour. The seventy-four elevators serving the R.C.A. building in the same group, travel approximately 2,100 miles between 8:00 a.m. and 6:30 p.m., when they are running on full schedule, and 2,000,000 miles is the estimated aggregate yearly mileage of the elevators in the five largest office buildings in



World's Fastest Elevator and Its Operator; It Is in Rockefeller Center and Travels 1,400 Feet per Minute; Below, Control Panel of Fastest Car

New York City. As ambitious builders added stories to their buildings, more speed was needed from elevators. With electric motors and strong steel cables available, developing this speed was easy. It was the old problem of control that was bothersome. The engineers wanted their elevators to slide up and down smoothly but at the same time they must be always under

complete control. The ingenious elevator men solved this problem too. Today, the express cars in the Empire State building cover eighty floors, the longest hoistways in the world, in less than one minute without the slightest suggestion of jerking or jarring. This means control not only of the car and passengers, but control of the approximately three tons of steel cable which carries each car.

Such control is made possible largely by a simple but clever new brake. When the car control is shut off, the actual brakes do not take effect immediately. The electric current is utilized to slow down the elevator in the same manner as the compression in an automobile slows the car down. The current works against itself. Then gradually the automatic brakes go on and the car slows down smoothly and firmly.

The self-leveling device takes control of the car out of the hands of its operator as it approaches a floor at which it is to stop, and slides it up or down until the floor of the car is flush with the exit door. When the car reaches a given point below or above the floor at which the operator wishes to stop, the leveling mechanism goes into operation. Once the car is flush with the floor it shuts off the power and applies the brakes.

Other less important obstacles had to be

(Continued to page 130A)

PULLEY SPEED CAN BE VARIED BY SIMPLE ADJUSTMENTS

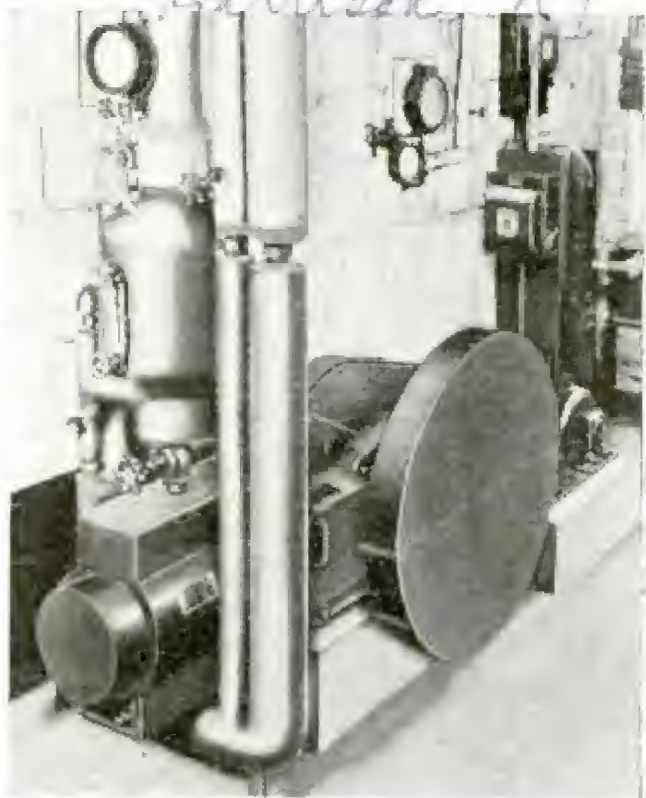


By making a few adjustments, the operator of a new V-belt pulley can obtain different speeds. A vernier scale on the pulley indicates the operating speeds.

Changes are made by expanding or contracting the diameter of the pulley. The range of speed can be increased fifty per cent.

(Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon receipt of a stamped, self-addressed envelope.

STEAM PRESSURE IS INCREASED BY BOOSTER PUMP



Small Booster Unit Raises Steam Pressure Beyond Capacity of the Existing Boiler

Steam can be taken from a boiler and raised in pressure by a booster machine that also handles distribution. The machine supplies steam at the pressure desired for some particular manufacturing process at a fraction of the cost of a new boiler of larger capacity. The pressure or the temperature can be regulated within very close limits. Built on the principle of a pump, the booster has special features that adapt it to pumping steam.

SIGN LANGUAGE USED BY PILOTS LACKING TRANSMITTERS

Airplanes which carry only radio-receiving sets can use a sign language to communicate with department of commerce radio operators at intermediate stations on the federal airways system. When a plane having no transmitter approaches a station and circles it, the pilot is giving a signal which means: "Please broadcast the latest weather report on this airway." The operator on the ground responds. After receiving the report, the pilot dips his plane or blinks its lights, either of which means: "Special broadcast received. Thanks."

Hammond Machinery

Air Commerce Bulletin



Artist with Some of the Designs Which He Has Fashioned from Sheet Metal with His Tin Snips; He Finds Big Demand for Weathervanes

MONEY IN WEATHERVANES ART FOR METAL CUTTER

Fashioning weathervanes from metal was started as a hobby by Henry Marx of California, but the demand for his products has grown until the artist has a thriving business. He has cut thousands of the novel vanes in a short time. Metal roosters, owls, witches, ships and other figures are snipped from metal and equipped with standards for attachment to roof tops.

AIR PRESSURE IN STROKEHOLD OF SUPER LINER

Air forced into the strokehold under pressure by means of huge blower fans will keep the engine room staff of the super liner, "Queen Mary," almost as comfortable as passengers walking the decks. The system supplies the air necessary to burn the fuel oil in the Cunard-White Star liner's engines. To get into the strokehold

a man must pass through an "air lock," a small chamber equipped with two air-tight doors. A special mechanism equalizes the pressure between the strokehold and the air lock so the doors may be opened easily. Each of the four main boiler rooms in the ship is more than sixty feet long and about eighty feet wide. The general color scheme is white, in marked contrast to the grimy strokeholds of most ships.

WATERPROOF PUTTY MADE OF RUBBER

Rubber putty which never hardens has been introduced for sealing glass in metal frames. It is a plastic that can be applied with ordinary tools. More waterproof than most sealing compounds, it does not crack with the passing of time. Paint applied over the putty dries readily and does not blister. The plastic is particularly adapted to sealing glass in steel sash, because of its adherence to metal.

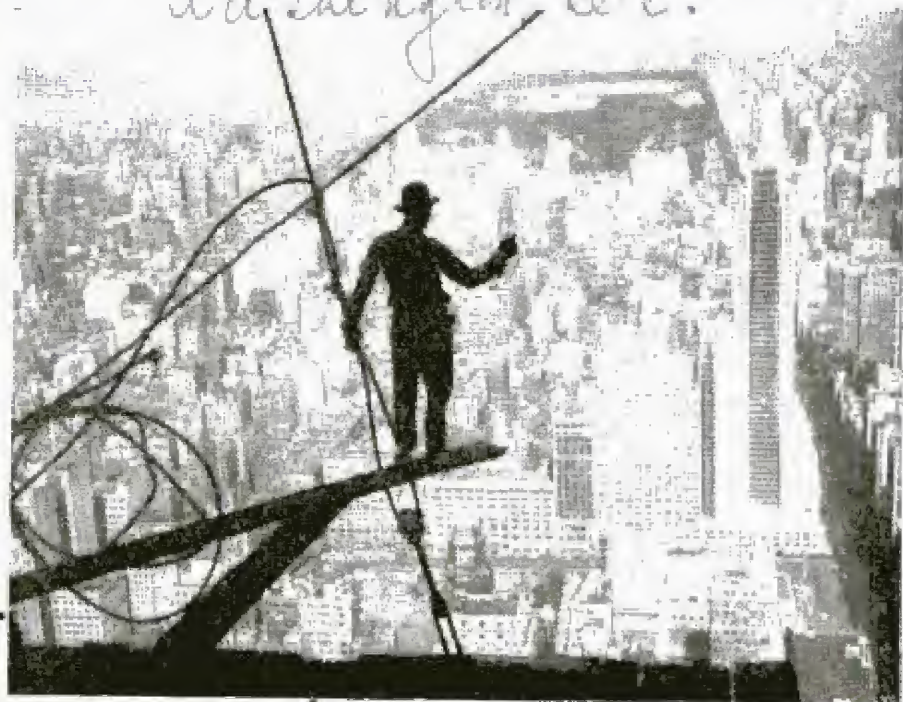


Illustrating the Ease with Which Rubber Putty Can Be Applied; It Forms Perfect Seal

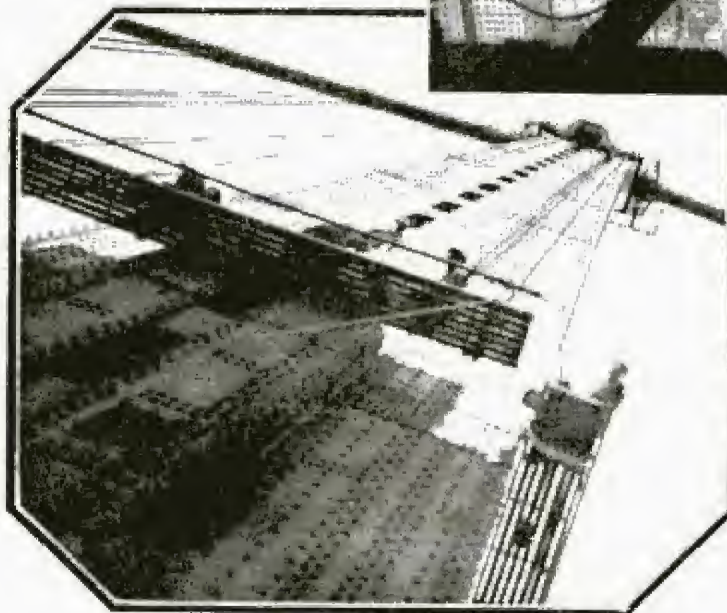
Cunard White Star Line B. J. Goodrich & Co.

It Takes Nerve to Work on Swaying Scaffold

Among the unsung heroes of industry is the painter who spends his days on a swinging scaffold suspended by ropes from the top of a building. He climbs like a monkey among ropes, over planks and around and across suspended scaffolding, but if he knows his business, his work is not as dangerous as it appears to the man gaping from the sidewalk below. "The idea," ex-



It's a Long Way Down for These Scaffold Men, Which Is Why They Take No Chances



plains one of these men who earns a living while suspended high above the ground, "is to test everything first. You don't leave much to chance if your life is likely to depend on it. Of course, accidents happen, but they don't happen very often to the man who makes sure everything is all right before he goes ahead." These scaffold men are particular about the ropes and the hooks. The careless man puts the hooks over a cornice but the careful one remembers a cornice may be weak, so he ties another rope to something on the roof, such as a chimney or water tank. When you see the scaffold men jumping up and down, they are not risking their lives but perhaps saving them. This is their way of testing ropes and planking before starting work. Wind is one of the

dangers they face, so they always keep an eye on the weather. A strong wind may blow one of the swinging scaffolds like a sail, endangering the lives of the painters with each swing. The scaffold men work in pairs or crews and hence must also trust their lives to each other. This is particularly true when they let themselves down on pulleys to reach a new "stretch" of painting.

One man at each end of the scaffold manipulates the ropes and failure of one to tie the right sort of knot may precipitate both to the earth.

E-187 — Gerosol RUST REMOVER FOR CHROMIUM

Rust formations can be removed from chromium-plated bumpers, headlamps and other parts by a non-abrasive liquid that requires no rubbing. The liquid also contains an element that imparts a transparent protective coating over the chromium. The makers claim the solvent will remove rust from painted surfaces without damaging the finish.

❑ Snowshoes, commonly considered an Indian invention, really originated in Asia

International Rustproof.

12507 Placer Ave

FLYING *the*



Three Midgets on the Line, Assembling the Fuselage, and One of the Baby Planes Taking Off

MODEL airplane builders who were pitching fragile toys powered with twisted rubber bands into the air a few years ago today are turning their skill to building flyweight miniature planes driven by real gasoline engines and engineered and built with nearly the same care that goes into the construction of a transcontinental airliner. With an ounce or two of gasoline in a fuel tank no bigger than a penny match box one of these midgets will take off on its own wheels, climb several thousand feet, and fly out of sight in the space of a few minutes.

Already remarkable records are being made. In 1934, a model you could span with your arms flew from the Camden, N. J., airport to Armstrong Corners, Del., fifty-four miles in direct line, but it is estimated the plane traveled 180 miles as the controls had been set for wide spirals. Observers in full-size planes have seen the miniatures climb more than a mile. With motors turning at 5,000 revolutions per minute the baby planes have speeds of more than fifty miles an hour. Next summer when speed dashes are held in California, the model builders expect racing ships fitted with one knifelike monoplane wing will be clocked at more than 150 miles an hour.

Observers see in the baby planes a new and dangerous military weapon. One of them could carry a "payload" of several

Brown Jr. motor - \$21.50.
plan for monoplane for same \$2.00

10555 Holman Ave
Los Angeles, Calif

2503 W. Arroyo St.
Los Angeles Calif.

"FLYWEIGHTS"

pounds of explosives and the controls can be set for straight distance flying. Where a plane will land can be controlled so accurately ahead of time that some of the builders are engaging in spot-landing contests. J. D. Bunch, who has built several flyweights,

*Bunch Model
Airplane Co*

is experimenting with radio controls to operate the engine and rudder.

"Tests indicate we will be able to make the plane, fitted with a short-wave receiver with a range of ten miles, taxi at will, take off and climb, level out, make right and left turns and spins, zoom, glide with power off, and make accurate spot landings," Bunch says.

It takes the skill of a real pilot to fly one of the baby planes. Half a dozen flights are usually necessary to make final adjustments so a new plane will perform. Most model builders adjust the rudders on the ground so the planes circle upward in wide spirals, descending to the ground near the takeoff in a slow glide when the motor stops. Your phone number or address painted on the side of the fuselage helps in recovering your plane if the controls are not skillfully set. With good luck a midget may make several hundred flights without being "washed out," although if the design or construction is faulty the first landing also may be its last. The elevators and ailerons of the models are not adjusted, guidance being obtained from



Motor and Propeller of One of the Baby Planes, and Starting the Engine of One of the Models by Pulling the Propeller



the rudder and motor and by shifting the position of the batteries, which act as balances. The planes are made to maneuver at will by the way the controls are set and by the angle at which the planes are launched. The speed of the motor and even the torque produced by the tiny power plant must also be considered.

The midget gasoline engines, so small that you could cover one of them with your fist, are of the two-cycle type and have one air-cooled cylinder with a one-inch stroke and a seven-eighths inch bore. Complete with two flashlight cells and a propeller, one of them weighs twenty ounces and develops up to six-tenths of one horsepower. The motor alone weighs six and one-half ounces. Instead of a car-

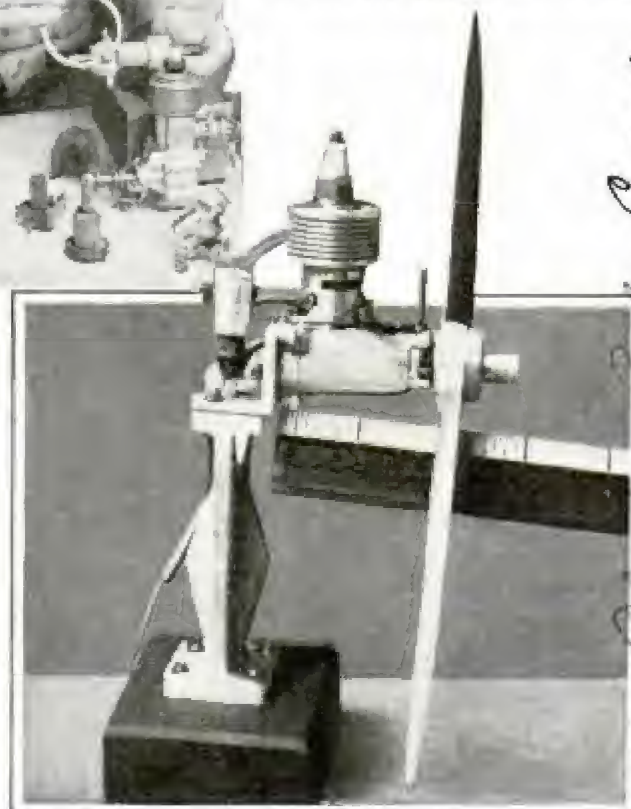
*Plane materials and accessories for
beginners flight ready May 1st.*



buretor the motor has a tiny mixing valve, and is equipped with a baby high-tension coil. The spark plug is one inch long and weighs one-quarter ounce. The motor "winds up" and howls like a real radial engine.

Two ounces of gasoline will fly a plane for half an hour, delivering from seven and a half to ten miles to the ounce of fuel. Most planes have automatic timers by which the owners control the duration of the flights, one type of cut-out consisting of a few gears from an alarm clock working from a little three-inch propeller that spins in the wind of the slipstream.

The babies are masterpieces of lightness and strength. Many are complete down to the smallest details, some builders even padding the cockpits, installing instrument boards and fire extinguishers, and equipping their models with working wheel brakes. In building a plane, Bunch lays out the plans, incorporating the latest aerodynamic knowledge in the design, and stressing the skin of the wings and fuselage to help carry the load. Then he subjects his work to stress analysis as a check. The wings and tail group are of the skin stressed cantilever type, the same design



Building Fuselage and Making Wooden Patterns for Baby Engine; Below, Midget Engine Which Develops One-Tenth Horsepower

being used in the fuselage, with the major weights mounted on long internal beams to distribute the load through bulkheads to the skin.

The airplane is built nearly like a scale model of a full sized plane and consists of a light balsa-wood skeleton inside a fabric of thin silk treated with nitrate dope. The landing gear is of the split-axle type and even has universal shock absorbers and pneumatic air wheels. The whole plane has a wing spread of five feet and weighs three and one-half pounds with the motor installed. Its gross weight, with the radio on board, is eight pounds.

The motor, mounted in the nose, turns a four-teen-inch propeller, and the streamline cowling around the motor fastens to the fuselage with large

Built by J.S. Lobbens,
Miami, Fla.

1433
Coral Gables, Fla.

American
Balsa POPULAR MECHANICS
Wood Products, 3040 Andrus St.

E 127

dress snaps. Other planes with larger motors have wing spreads up to ten feet. Properly designed and constructed, one of the midgets vibrates hardly at all.

You can build a gasoline-engined plane for as little as twenty-five dollars, all but five dollars of that amount representing the cost of the engine. Or, if your shop equipment is complete enough, you can buy rough castings and blanks for a motor for a few dollars and build it yourself.

Amateur builders also have constructed all-metal airplanes, flying boats that taxi and take off from the water, flying wings, autogiros, and camera planes that carry lightweight cameras and snap the films at pre-arranged intervals. Compressed-air motors have been tried by some enthusiasts, and rocket planes that derive power from skyrockets have been flown.

Miracles of flying also are being performed by the models powered with rubber bands. The models are replicas of modern airplanes, some built to a scale of one-half inch or one-quarter inch to the foot. The indoor duration record for a rubber-band model is twenty-two minutes, made inside the airship dock at Akron, Ohio. Scale models of fighting planes have climbed out of sight in the sky in five minutes, literally hanging by the propellers as they spiral upward. Nearly any beginner who assembles his model with ordinary care can look for flights of two or three minutes. A rubber-driven model has been clocked at sixty-six miles an hour, a remarkable speed for a few ounces of wood and tissue paper. By arranging for controls to change as power is exhausted, models can be made to maneuver.

The latest development in the small models is the use of microfilm as a wing covering. This film, prepared by spreading a few drops of nitro-cellulose solution on water, is so thin that fifty square inches of it weigh one-one-thousandths of an ounce.

Most spectacular of the rubber-driven planes are the "stratosphere" models with a wing spread of three feet, although they weigh only one and one-half ounces. Built of tissue paper and thin balsa-wood splinters, the fragile planes could almost be crushed by a strong breath, yet they climb to 2,500 feet and soar for half an hour with the propeller "free wheeling" after the rubber power has been exhausted.

MOTOR-DRIVEN WHEEL CHAIR TRANSPORTS CRIPPLE

Los Angeles, Calif



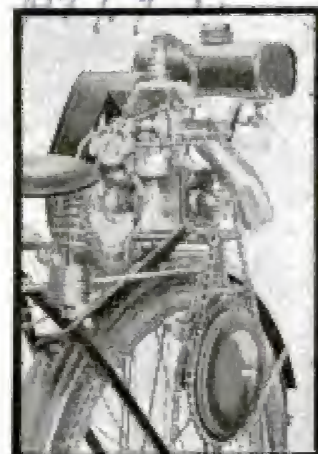
Motorized Wheel Chair for Invalid Operated by Two Levers, One for Steering and One for Accelerating

One Salt Lake City man who is unable to walk makes a living selling small articles with the aid of a motorized wheel chair which he uses to get about. The vehicle is a combination of a hospital chair, bicycle wheels, a chain sprocket and a small gasoline motor. It starts with the momentum of the chair and is operated by two levers, one used for steering and the other for accelerating and braking. The chair can travel as fast as seven miles an hour and already has covered more than 2,000 miles.

E 87

CHAIN-DRIVE BICYCLE MOTOR FITS OVER REAR WHEEL

Supported by the axle of the rear wheel, the latest bicycle motor has positive chain and sprocket drive with a disk clutch and a throttle control on the right handle. The one-cylinder air-cooled motor is one and one-half horsepower. Built-in ignition and efficient carburation make starting easy. It can be used for driving small mills, lathes and drills.

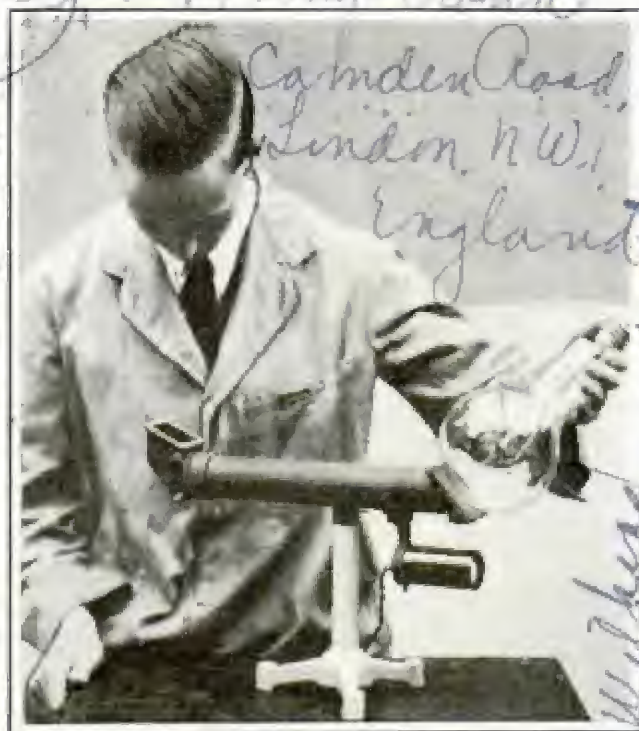


Byron Barney
H. Jones

Midvale

Dec. 9/10/39

Minneapolis Works



Measuring the Thickness of Glass Bulb's Walls: Scale Gives Accurate Reading

GLASS BULB WALL MEASURE WORKS ON OUTSIDE

Measuring the thickness of the wall of glass bulbs or vessels from the outside is possible with a gauge exhibited recently in London. The bulb is placed over an orifice at one end of the gauge and the thickness is determined by glancing at a scale at the end of the other end. In the case of large glassware, the gauge can be unscrewed and carried to the object to be measured. The scale has readings for glass up to six millimeters.

MAGNIFIER ON PEN OR PENCIL ENLARGES FINE PRINT

Checking names in telephone directories or other books containing fine print is made easy with a pen or pencil which contains a magnifier on one end. By placing the magnifier over the print, the letters are enlarged to several times their real



Pen Equipped with Magnifier for Reading Fine Print

size for easy reading. The pencil contains extra leads and an eraser, and the combination can be obtained in several finishes.

TWO-WHEEL MOTOR CARRIER HANDY FOR SHOP OR FARM

With a new two-wheeled truck, an electric or gasoline motor can be moved easily by one man from one machine to another. Only a few minutes time is required for setting the truck in place and belting the motor to the driven machine. A shovel stop in front and sliding stakes at the rear lock the truck in position. The belt is kept at the proper tension automatically by having the motor mounted on two arms pivoted above the front axle, so located that part of the motor's weight is carried lightly by the belt. The truck will take electric motors up to ten horsepower, 1,800 revolutions per minute, or gasoline en-



Motor Operating Farm Machinery Is Shown on Truck Which Makes Handling Easy

gines up to 450 pounds weight. It is handy in shops or on the farm where one motor can do the work of many.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Ancient War Catapult Is Rebuilt for Movies

One of the largest "props" ever used in motion pictures is the eleven-ton catapult constructed for a film dealing with the Crusades. The catapult is said to be the biggest single prop ever built in Hollywood. An idea of its size can be gained from the fact that each of its solid wheels is about five feet high. Ordered by Cecil B. De Mille for use in one of his movie spectacles, the giant engine resembles those with which the ancients conquered the walled cities of that time.



Directing the Finishing Touches on Huge Catapult for Use in Movies; It Resembles War Engines of Ancient Times

PLANTS GROWN WITHOUT SOIL IN ARTIFICIAL GARDENS

Synthetic gardens in which soil is unnecessary and where temperature, mois-



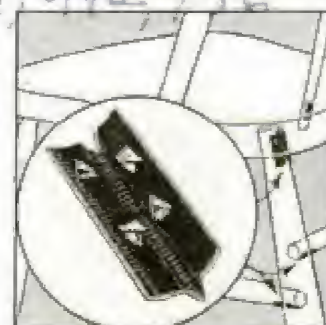
Plants Being Grown in Tanks of Water to Which Mineral Salts Are Added; Note Artificial "Suns"

ture, wind and sunshine all are produced artificially have been developed by Dr. R. A. Davis, professor of plant physiology

of the University of California. In his laboratory, Dr. Davis grows his plants in tanks of water to which carefully measured amounts of the essential mineral salts are added. Flood lamps supply the sunshine, and composition of the air is changed by adding or subtracting oxygen.

LOOSE RUNGS ARE MADE TIGHT WITH METAL HOLDERS

Loose chair rungs and table legs can be tightened quickly without the aid of glue or nails by using metal holders which are made in assorted sizes. The curved holders are equipped with tangs or prongs and are inserted in the sockets after loose rungs are removed. When the rungs are driven home the holders are also forced into the sockets and any force tending to remove the rungs only increases the grips of the holders on both rungs and socket walls. The tighteners also are used to hold handles on mops, mallets, brushes and other tools having wood grips.



Art. Product

8.94 Cont. Don Blasey.
4 W. 10 3rd St. New York

SIGN Talk SPEEDS



RADIO, the most modern form of communication, has revived the most primitive language known to man—sign talking.

Radio has gone back to the Stone Age for a language suitable to broadcasting and today, no large studio functions properly without the use of certain visual signals. Listeners, of course, are unaware of the "silent broadcasting" which takes place between engineers, announcers, artists, conductors, and other members of the studio staff.

By means of this highly specialized deaf-and-dumb language, studio technicians exchange ideas, deliver commands, and direct the action of performers. This strange radio language originated out of sheer necessity. The rule of every studio is, "No talking." Notwithstanding, somebody must

Some of the Many Signs Used by the Radio Director to Convey His Commands to the Performers in the Studio and to Engineers and Technicians Outside

E. 74

RADIO DRAMA



direct the performance, and since any audible language is absolutely forbidden, the technicians found several substitutes. First, they sought to solve their problem with a telautograph which reproduces handwriting but this proved slower and clumsier than a simple sign language. Today all mechanical devices have been discarded and man-made signals are used exclusively.

The great chain programs employ the latest technique because their time is often valued at hundreds of dollars per minute. Misunderstandings are costly and embarrassing.

Jay Hanna, who produces and directs well-known national hookups over N.B.C., also has conceived many of the symbols in the studio sign language which enable the director to issue his silent commands. This

Radio City studios



Because No Audible Orders Can Be Issued, Those Who Direct the Radio Programs Have Been Forced to Devise This Intricate Signal System of Communication



By Means of the Sign Language as Used in the Radio Studio, Virtually Any Order Can Be Issued; Hand Signals Have Been Found Faster Than Any Mechanical Method of Communication

director has spent days, possibly weeks in preparing a program. He has held rehearsals, had conferences with engineers, program sponsors, musicians and players and has arranged sound effects and revised scripts.

Finally comes the supreme test of his ability. In one-half hour of broadcasting time he must condense weeks of work and study. Forty musicians must play as a man; thirty speakers must take their cues on the instant; fifty extras must roar, bellow, shriek, and groan on schedule. And the director must supervise it all.

People who are admitted to one of Mr. Hanna's broadcasts are astonished at the precision of the performance. One hundred, or more, people are under his direction. They seem busy following their scripts but each person also is watching the director out of the corner of his eye.

One flip of Mr. Hanna's hand and the orchestra swings into a tune. Another flip and he evokes the voices of a mob. The studio is vast, almost a block long, but his hands are like stop-and-go signals. From deafening reverberations, he can change



CUT PROGRAM AFTER "FADE"



IS THERE SYNCHRONIZATION?



FADEOUT

the volume to a mere pianissimo whisper by a snap of his fingers.

Sounds may be so low that none but Mr. Hanna can hear them. He wears a "headset" and voices and music are relayed to his earphones by a special amplifier, enabling him not only to follow the performance, but to hear it with a fidelity unknown even to a good radio receiver.

His headset was built to special order and this supersensitive device enables him to hear everything. He can even hear the infinitesimal hiss of a vacuum tube.

"Suppose," says Mr. Hanna, "that you are broadcasting a scene where somebody coughs, a door opens, a canary chirps, and a clock rings, all within fifteen seconds. What the broadcasting director must beware of is an overlap of sounds. Unless the man coughs at the proper moment, the sound might conflict with the closing door, and upset the rhythm of the whole performance. But with my supersensitive headphone, I can hear the rush of air

(Continued to page 120A)

Doll House Is Furnished Like Modern Home

One California girl is the proud owner of a doll house equipped with everything the modern home possesses except possibly a mortgage. The two-story house was built by the girl's father, each room is completely furnished with doll furniture and all the rooms are wired for electricity. By dropping one wall, the second-story rooms can be lifted out for arranging the furniture in both the upstairs and downstairs. The walls are papered and even the kitchen and bathroom are equipped completely with furnishings made on a miniature scale.



Doll House with Removable Second Story Furnished Like a Modern Home

Battery Filler on Stilts Aids in Servicing Cars or Trucks

Water can be added to automobile batteries, and storage batteries of motor trucks can be serviced easily with the aid of a gravity filler consisting of a keg of

bringing the water from the barrel to the handle end which is equipped with a nozzle and an indicator at right angles. When the nozzle is inserted in the filling vent, the water begins to flow. When the plates are covered to the proper depth, an electric bulb on the handle lights, current for the bulb being obtained from the storage battery being serviced.



Battery Filler on Portable Raised Platform Makes It Easy to Service Autos and Trucks

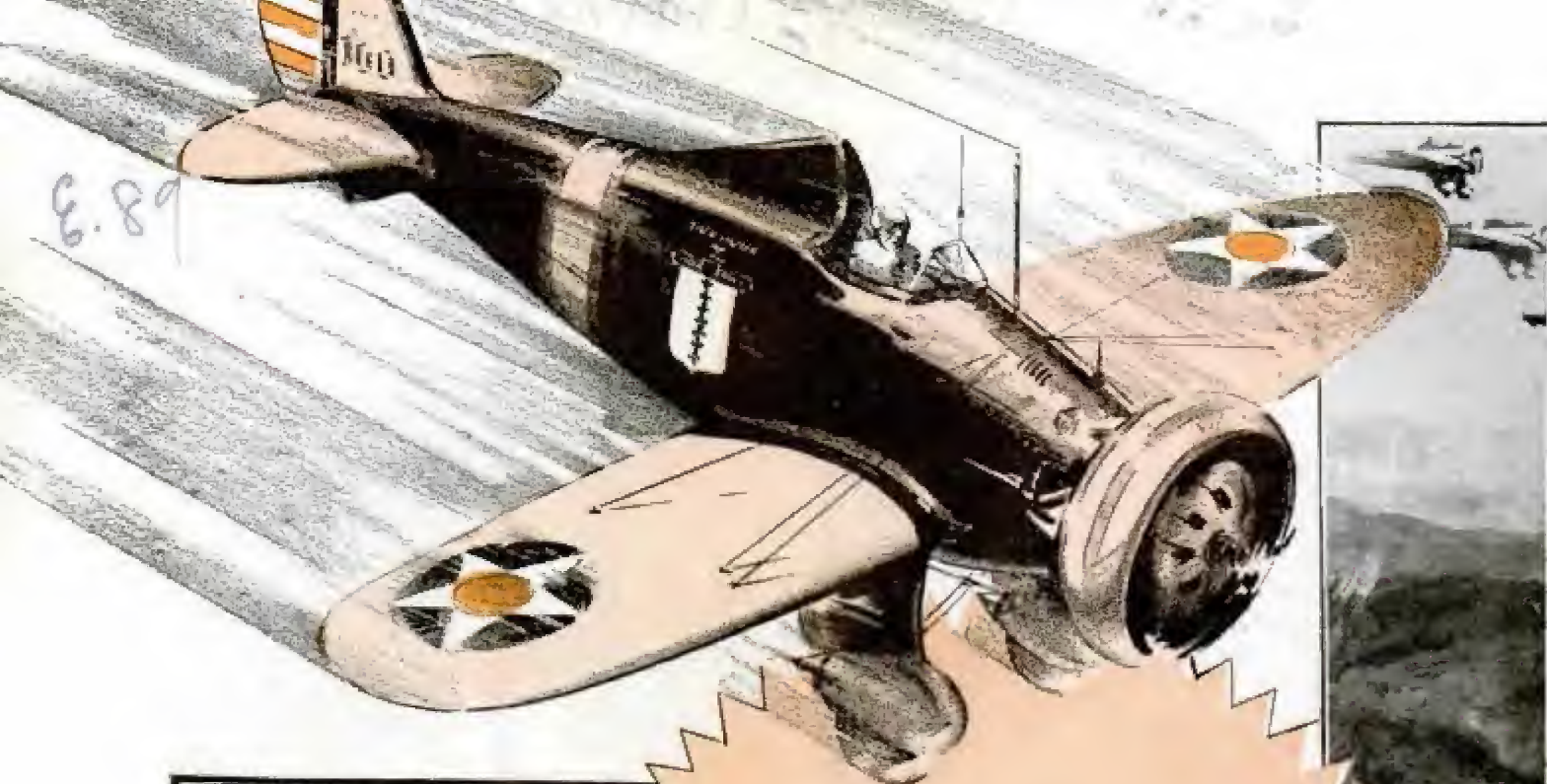
ELECTRIC-WIRE FARM FENCES RESTRICT ANIMALS

Farm fences carrying electric wires have been found a means of restricting animals. The wires are connected to a control unit that plugs into a light socket. While the shock is sufficient to keep the animals away from the fence, it is not severe enough to be dangerous. In some cases, only one wire will accomplish the desired end, resulting in a saving on fencing materials. No gates are needed, the animals being moved by stepping on the wire and throwing a burlap bag over it to permit passing. The same method can be used in the city to keep animals out of yards.

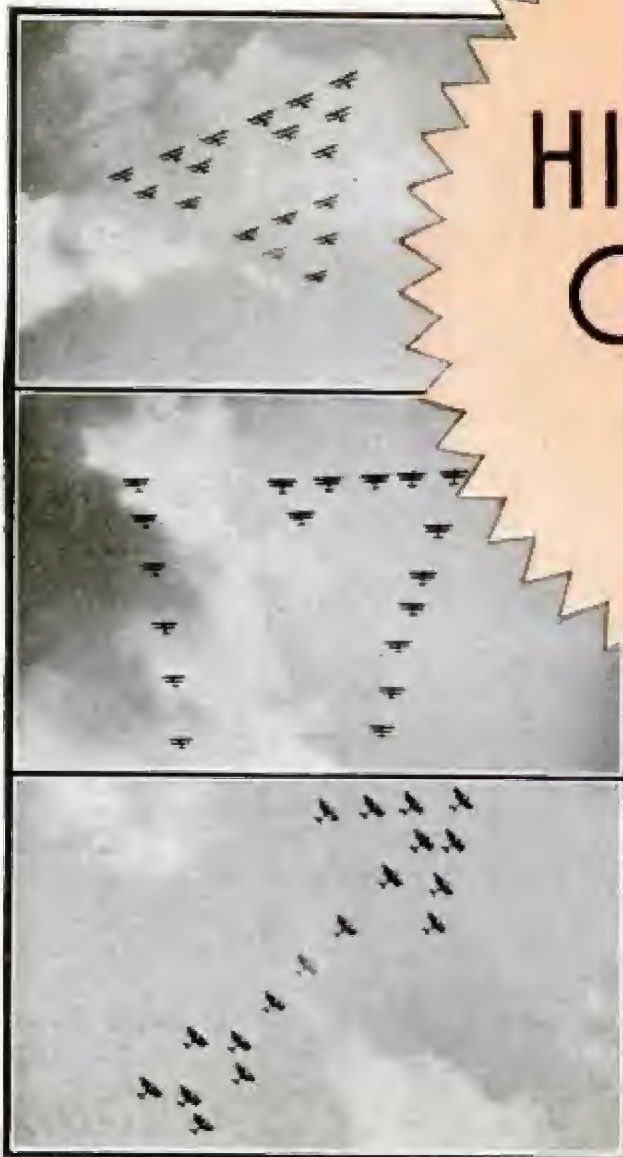
distilled water mounted on an elevated framework. The equipment is rolled beside the car to be serviced, a length of pipe

George A. Krug

The Prime Mfg Co
1670 N. 1st St
Milwaukee, Wis



HIGH SPEED CHANGES *in* FLYING



Top, a Boeing Monoplane, One of the Latest Speed Ships Used by the Army; Below, Planes Forming a Perfect Triangle; the Seventeenth Pursuit Squadron Painting Its Number against the Sky with Its Own Planes, and Army Planes Flying in a Close Formation Which Depicts an Arrow

NEW type speed planes built for war purposes call for new kinds of technique in formation flying.

Nobody knows yet just exactly what can be done with these "flying motors" and if some of the old-time cadets were to hear the talk by modern pursuit pilots, they would not even know what some of the conversation meant.

One might hear a test pilot say: "Well, I guess I'd better tape myself up to try out that new job. I don't want to black out."

Or, after landing from a formation flight, "I thought my ox pipe was plugged while we were at 30,000 feet, that's why I dropped to 20,000."



Head on and Side View of Stair Step Formation; Right, Pilots in a Huddle on a Difficult Formation

"Now, the way I pull out when the clock says 350 miles—"

"If you ever roll that baby without throttling down, your head snaps off."

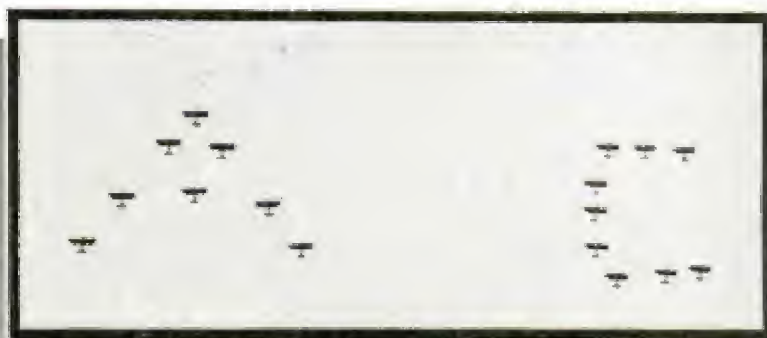
And indeed, the edges of the old-time dog fights in the air have had to be trimmed down to fit these planes. The speed must be cut down these days to do any real stunts. The high-speed planes can put on shows, and they do it on occasions, but the stunts are pretty simple—at least to the eye. But only to the eye.

The thing which thrills an old airman more than anything else is to watch the speed "stuff" climb. This is a source of delight to every aviator who has cracked



a throttle on a military plane. All the power and speed seen today came with the development of the monoplane, especially the low-wing monoplane. The reason the low-wing monoplane is liked is because the wings get into the ground "bank," and

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Winged Motors Flying in Very Tight Formation and Pursuit Squadron Spelling Out the Letters "A.C.," for Air Corps

slower landings are possible. Theoretically, the highest speeds can be obtained with a mid-wing plane. But the low wing allows good visibility ahead, and the pilot can watch the wing guns. Also, being able to slide along the ground on wings instead of under them in a forced landing is another pleasant idea.

When a pilot of the high-speed planes goes into formation, he merely heads his ship for the right direction, allowing for the speed of the other planes, and noses into place. He puts his motor where it belongs in behind the ship in front. He pays little attention to such trifles as one wing low, or other faults drilled into him at fly-

ing schools. He is really flying a motor set out in front of a couple of small wings. And a pilot feels that these wings and the tail surfaces are only necessary evils used to guide the powerful, booming motor. And he is just about right.

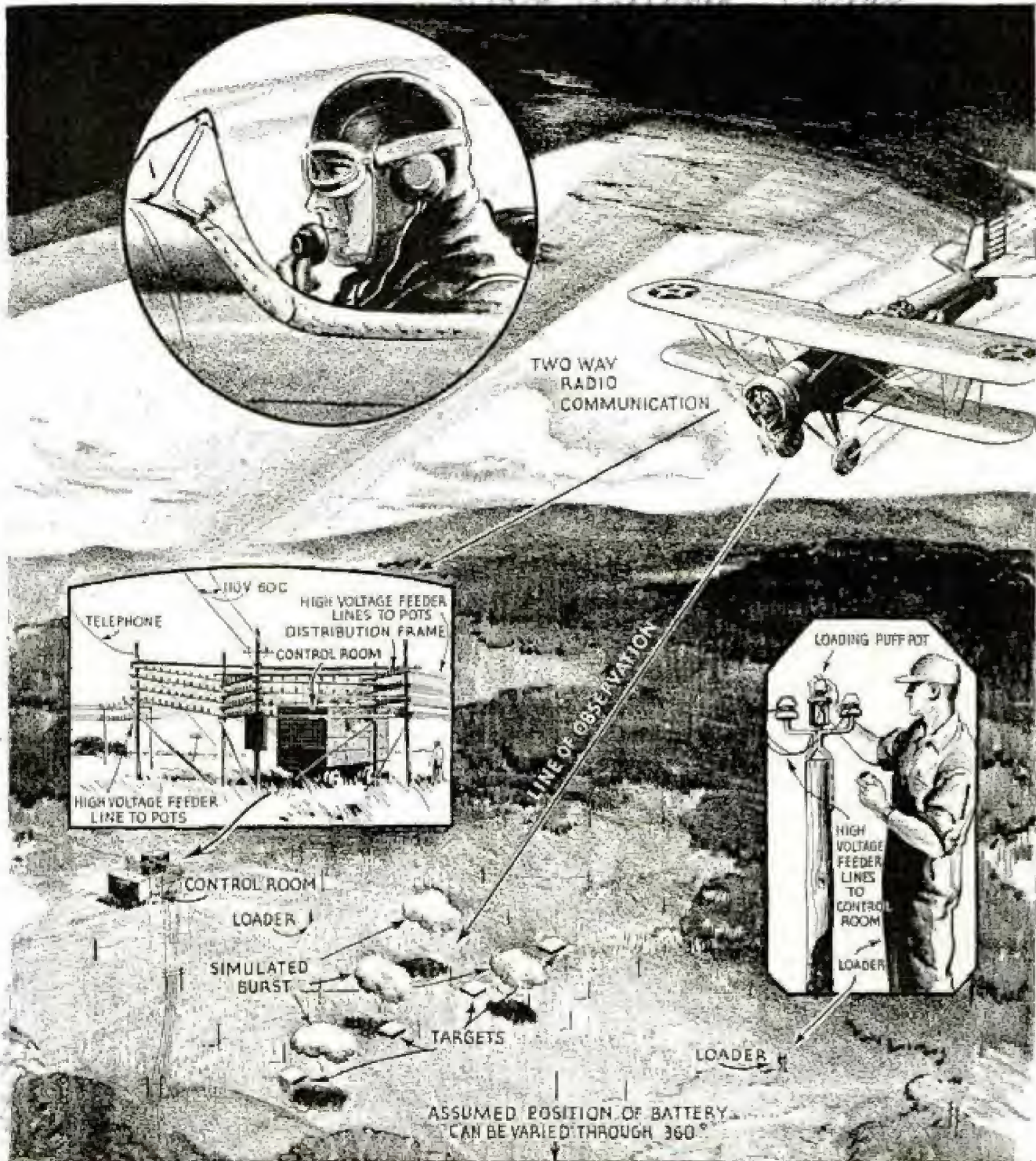
These speed planes are trimmed down so much to prevent drag in the air that pilots have little room to themselves in the cockpits. They squeeze into the cockpits "with a shoe horn." And getting out—that's something else. "You'd think a guy was never supposed to get out of one of these things," said a speed pilot not long ago. The scooped-out headrests are for safety as well as for comfort. "If you stick your head out," one pilot said, "you're apt to pull back only a neck." This is about true, too.

To escape from a disabled speed plane the modern "doctrine" seems to be to turn

the plane on its back and try to fall out. Many speed planes will flip the pilot out if they get half a chance. If a pilot's safety belt becomes loose, he may find himself floating along in mid-air without a plane. This has actually happened.

The advent of the speed planes has brought up the never settled question as to whether it is better to have a lot of speed and small maneuverability or plenty of maneuverability and less speed. Only time will tell which is most important. But the speed planes have changed the formation technique, and many experts declare that the "good old days" of slow planes and high maneuverability are gone forever.

'Puff Targets' Train Army's Flying Observers

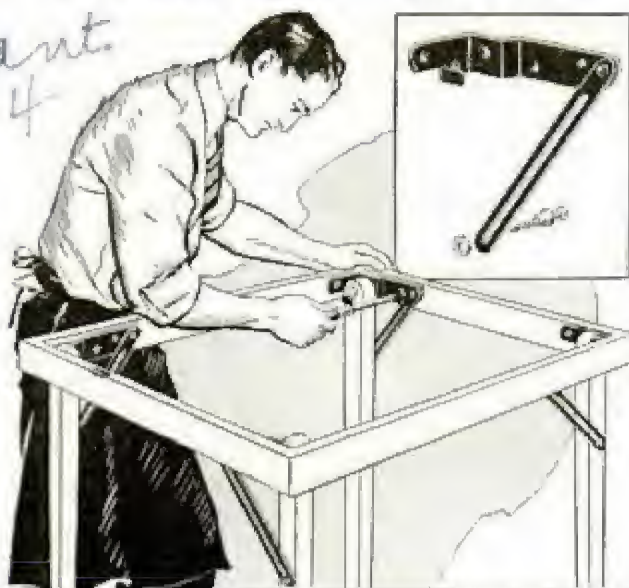


Arrangement of Puff-Target Range, with Observer (Top, Left) Reporting Small Puffs on Ground as "Hits"; Puff Pot Is Shown at Right, Inset

Without a gun being fired, the U. S. army's flying observation students at Kelly Field, Tex., are trained in reporting by radio where the "shells" hit. A "puff-target" range is the secret. It consists of ninety puff pots of gunpowder mounted on five-foot posts. The powder on each post is set off by an electric spark from the control-room switchboard. As the obser-

vation plane flies over the range at an altitude of 4,000 feet, the puff pots are set off and the observer reports the range and deflection of the bursting shells, represented by groups of puffs. Problems are prearranged by the instructor who receives the observer's radio report and makes corrections for the next salvo, represented by another group of puffs.

FIXTURE MAKES FOLDING LEGS FOR HOMEMADE CARD TABLE



Brace Which Simplifies Construction of Homemade Card Table with Folding Legs

Construction of hinged-leg card tables and tennis tables is simplified for the home craftsman by using a set of durable leg supports now being marketed. Besides supporting the legs, the fixtures serve as rigid corner braces. They lock automatically when opened and slight pressure on the diagonal spring steel braces causes them to unlock for folding.

LAMP FITS HEAD AND LEAVES THE HANDS FREE

Designed to fit the top of the head, the latest mechanics' lamp throws a light directly on the work and leaves both hands free. The headband of spring steel adjusts itself to any size head, a slight bend of front and rear brackets making it fit as

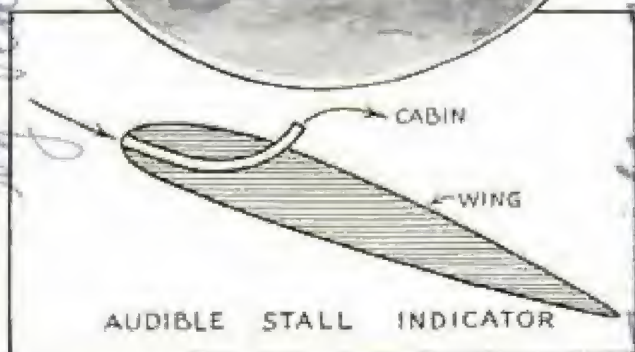


Left, Lamp with Head Clamps; Right, Showing One of the Lamp's Uses

though designed for the individual. The lamp plugs into any convenient electric socket. Its air-cooled shade prevents the wearer from feeling heat from the lamp and protects the eyes, giving full vision at all angles without moving the head. A standard inside-frosted bulb is used in the lamp. The cord is waterproof.

PILOT WARNED OF STALLING BY VENTILATOR TUBE

Devised as a means of ventilating the pilot's compartment of one plane, an air tube has been found to serve the purpose of a stall indicator. When the plane reaches



Sketch Shows Ventilator Tube That Warns Pilot When Plane Reaches Stall Angle

the stall angle, the tube emits a deep tone, warning the pilot of a major change of air flow. Discovered by accident, the principle may be used in designing a stall indicator for other planes. The tube might be mounted on the leading edge of one wing.

Iron and steel and copper and brass can be cleaned of rust and verdigris by using a non-explosive, non-poisonous fluid now on the market.

Mechanix Head. Life Mfrs
146 1st Floor Bussell

no info as to make

Individuals see 520

no address

Cardboard Cats Are the Latest in Scarecrows

Designed to protect crops in the manner of the scarecrow, cardboard cats have been erected on a farm in south Scotland. The cardboard figures are strengthened with wooden laths, making it easy to install them in the fields. The artificial cats, black on one side and white on the other, are said to frighten away birds and field mice while the seed are in the ground.

E 182

BRAKE AND WHEEL TESTED ON SAME MACHINE

Combining the testing of brakes and wheel alinement, a new Weaver machine speeds up automotive servicing. Entirely automatic, the tester is operated by the car owner in the simple act of driving onto the floor plates and stopping. Visual indicators register actual steering conditions



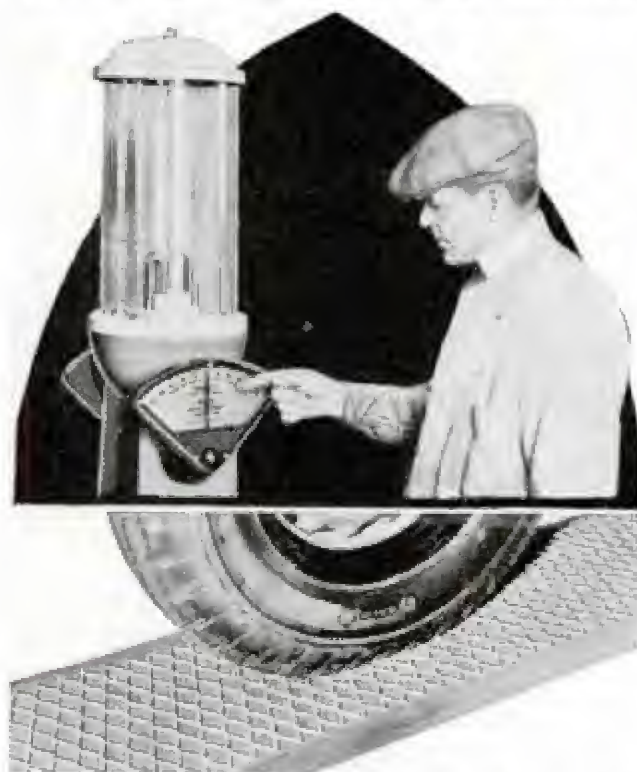
This New Idea in Scarecrows Is Said to Be Effective; the "Cats" Are Made of Cardboard and Are Mounted on Laths

and the brake energy in pounds for each wheel. The machine, by performing the two tests, saves space and can be used in small service shops. The floor plates have rounded edges that will not injure tires.

SHOWER BATH LOCK PROTECTS

E 188 USER FROM BURNS

Automatically preventing an excess amount of excessively hot water from passing through the shower head, a simple guard protects the bather from being scalded. Once installed, the locking device maintains control of the hot water without adjustment. It can be installed in a few minutes without altering the plumbing or marring the walls. If scalding water or steam suddenly enters the pipe, the guard operates instantly, closing the shower head before enough of the hot water or steam is released to burn the bather.



Top, Taking Readings on Combination Tester; Bottom, One Wheel of Car on Floor Plate

Weaver Mfg Co.

Federal-Huber Co.

D 1456. Mr. John A. Macey
Box 292, Hollywood, Calif

The GAG'S



The "Villain" Literally Wraps a Telephone Pole around His Victims in This Educational Pictures Gag

By HAL ROACH

IN the motion-picture industry the situations that produce laughs are called gags. Gags are the life and breath of comedy. They cover every type of humorous situation from the pie-throwing incident of pure slapstick to the man who finds his prized watch in the pocket of the person he has just ducked in the pool.

A comedian can be just as funny as the situation will allow, and no funnier. True, some comedians can make a funnier situation of a certain incident than others, but that is merely a measure of ability. It is the gags, the incidents in a comedy, that are remembered, and not the story itself. This is as true in dramatic productions as in comedies. In drama the high spots of the play bring emotional reaction from the audience, tears, smiles, or



Trick Automobiles Which Do Unexpected Stunts Are Usually Good for Laughs as the Gag Man in This Hal Roach-M-G-M Comedy Knew

even hisses. In comedy, they bring laughter—and are called gags.

A gag is a situation that is turned from the expected into something humorous and unexpected. An automobile going

the THING



down the street is just an incident, but if it comes to an abrupt stop there is a shock to the senses of the observer, and the incident may have become dramatic, depending on the story involved. But if this car, traveling along in a very ordinary way, suddenly stops and does a complete back somersault, that is a gag. An extreme example but it illustrates the point.

In movie comedies, there are several kinds of gags. There is the funny situation that is building up to the climax of the story, and is a necessary part of the story itself—that is called comedy business. There is a bit of business, injected for an incidental laugh, that will stand by itself—an incident that would be funny whether the story existed or not—and that is an incidental gag. Then there is the running gag, so called because it is represented at intervals through the pic-



Above, a Car Wreck with a Humorous Turn and a Little Girl and a Very Large Spider; Below, Men in Women's Clothing Usually Look Ridiculous

ture. A gag is capped or topped, in movie parlance, when it reaches its climax. The comedy business gags throughout the picture are capped individually, and then are double-capped by the sub-climaxes of the



Above, a Double Gag with the Washing Machine Out of Control and the Man Wrestling with His Umbrella; Below, Glue Causes Trouble

story, the high moments of a series of connected incidents. The incidental gags are capped also. Almost every gag is good for at least three laughs, one at the gag itself, another at the incident that caps it, and a third at the reaction of the players. A flash from the reaction of one player to that of another will often double the laughs there.

The test of a gag is, of course, whether or not it is funny. Until we show a picture, we have no standard by which to judge it other than the old standby, "Is it funny to me?" There is no such thing as an average intelligence or a certain level

at which to aim our humor. Comedy situations appeal to old and young alike, and the roughneck will laugh at the same thing that amuses the college professor. We have to judge entirely by our own reactions. Sometimes we are fooled, and the thing that seems funniest to us will fall flat, while some bit of "must" business, put in because it had to be there to advance the story, will get the laughs instead.

Since the old pie-throwing, slapstick days, the gag has changed but little in substance. It is still a situation that is given a humorous turn. But in execution it has changed a lot. The gag started as pure physical humor—a man slipping on a banana peel and falling or a car running into a telephone pole. Those incidents were exciting and funny in a day when little happened in people's everyday lives. Now the gag must be more subtle. The broad humor of that day will produce only laughs of derision today. Along the same line, the gag must now have a reason for its existence. It must advance the climax of the story, bring out

some phase of a player's character, or, in the case of the incidental gag where more license is allowable, it must at least fit in with the action of the previous gags. No more is a comedy a series of funny situations, thrown together with no regard to their relation to each other.

The talkies have done much to change comedies. Formerly, we photographed our action at the rate of twelve frames per second, and projected it at twenty-four per second. That made our action appear on the screen twice as fast as it had actually been acted. Now, we must record both sound and sight at the projection speed, twenty-four, and the action must be carried out at the speed at which it is to appear. The talkies also cut out a lot of action that formerly was necessary to explain the story. Now, to make it clear that a woman's husband is a policeman, she mentions it in the dialogue. Before, she would be shown kissing him goodbye as he left for work. The dialogue now possible also is responsible for some of the laughs in spoken lines, which the titles in the silent picture days could not get across.

These are mechanical changes. Broadly speaking, the comedy has not changed much with the years. Even the same old bits of business are sometimes given a new presentation, a new setting, or are worked out from a different angle. Of course, there are many variations of the old laugh-getting situations. Some of the methods, such as the combining of animation and sound in the animated cartoons, are new—and there is even a new gag occasionally. But with new methods or old, the gag's still the thing that makes or breaks comedies.

LAWN PISTOL KILLS WEEDS WITH ELECTRICITY

Dandelions and other lawn weeds are being killed with a pistol which shoots a "bullet" of electricity to bring death. The barrel, or point, of the tool is pushed about one inch into the heart of the plant. When the trigger, which is a switch, is pulled, the point heats up to more than 500 degrees, cooking the heart of the weed and killing it instantly. The handle of the tool is shaped like the conventional pistol grip, a cord extending from it to any convenient electric outlet. Since the heat is localized,



Operating an Electric Pistol Which Burns Heart of Weed When the Trigger Is Pressed
the surrounding grass is not harmed when the weed in the lawn is killed.

PORTABLE DRINKING FOUNTAIN IS COMPACT AND SANITARY

Drinking water can be supplied to outdoor workers in sanitary form by using a portable fountain holding three gallons and simple in operation. The container is



made of galvanized sheet metal and is equipped with a pump. A single short stroke of the pump plunger forces a stream of water from the nozzle at an angle. A chromium guard prevents the drinker from placing his lips in contact with the nozzle,

and expelled water is prevented from returning to the interior of the fountain. It is filled by removing a screw cap, and a wood handle makes it easy to carry.

Three hundred and seventy-two women hold pilot's licenses in the United States.

H. and D. Electric Co.

Magnetic Signal Co. 3355 E. Hansen Ave. Los Angeles, Cal.



Game of Putter-Pool in Progress on Outdoor "Table"; Golf Putters Are Used to Knock the Balls into the Pockets

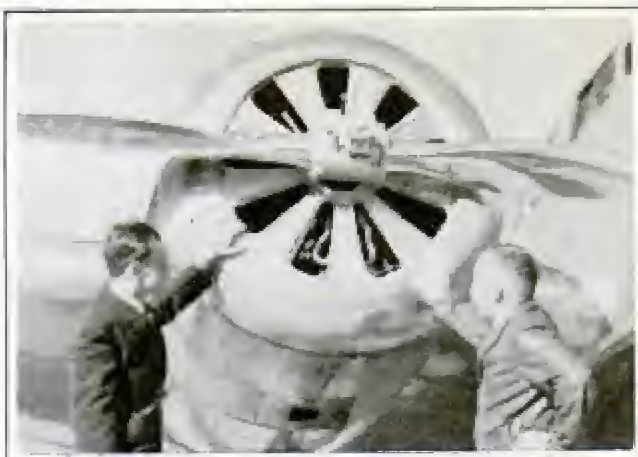
OUTDOOR "PUTTER-POOL" GAME PLAYED ON GIANT "TABLE"

Outdoor pool and billiards can be played with golf balls and putting clubs on a giant "table," twenty-four by twelve feet. The table has a surrounding edge, four inches deep, with pockets or holes in position as on a billiard table. If putting practice is desired, the player uses the holes in succession, going all around the table, from a tee starting point, and counting the strokes for the six holes.

E-12

ARCTIC AIRLINER IS EQUIPPED TO FIGHT ICE AND SNOW

Equipped to battle ice and snow, a Lockheed Electra airliner has been placed in



Vents in Nose of Arctic Airliner Which Can Be Closed by Shutters to Keep the Motor Warm

service in Alaska by Pacific Alaska Airways. By means of shutters controlled from the pilot's cabin, the cold air can be shut out completely from the engine, protecting both the crankcase and cylinders. Ice shields, or abrasion shoes, have been installed on the sides of the fuselage nose to protect the metal from ice that is thrown back by the two propellers.

E-190

TELEPHONE HOLDER HAS LIGHT, CLOCK AND CALENDAR

Containing a tray in which the telephone instrument rests, a holder for the phone is equipped with a light which is switched on automatically when the receiver is lifted.



Telephone Holder Equipped with an Electric Light, an Electric Clock and a Calendar

The light illuminates the dial, the directory and an electric clock and monthly calendar, the latter two objects being a part of the holder. The light goes out when the receiver is replaced and a toggle switch can be used to disconnect it in the daytime. The clock and calendar are convenient in checking long-distance calls and in making appointments. The tray holds the phone base rigidly while dialing. There is also a wall model of the holder. Both the light and clock operate from city current.

Windsor Ave. Can.

M. Brasseur & Co.
65 E. Duellette Ave.

Hat with Adjustable Band Will Fit Any Head

Shaped like a helmet, a hot-weather hat is equipped with an adjustable band by means of which it can be made to fit any head. Clips hold the sweatband away from the hat so there is a space between the helmet and the band, allowing air to circulate freely over the wearer's head. The sweatband is adjustable by means of elastic. The helmet is made of several layers of materials. The center ply consists of long fibers pressed into shape and the next layer is a plastic on top of which is placed a finishing fabric, both inside and out. These layers are all bound into one, making the helmet strong and waterproof.



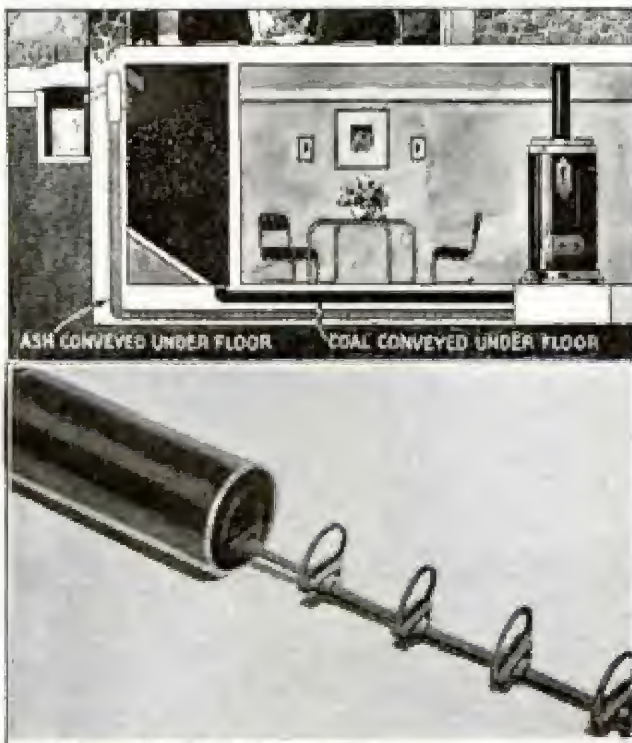
Hot-Weather Hat with an Adjustable Band Which Can Be Made to Fit Any Head and Which Holds the Helmet Away from the Head

The helmet can be cleaned with soap and water, and chin strap and sweatband are detachable.

Furnace Coal and Ashes Flow Through Conveyor Pipes

Ashes can be carried from the furnace to the outside and coal from the bin to the furnace by a conveyor system that uses pipes no larger than standard gas and

water mains. The conveyor consists of a number of open steel rings attached at intervals to an endless steel cable, which moves slowly through light-walled tubing. One small motor is powerful enough to handle the most complicated installations. Twists and turns are no drawback, since vertical lifts and even right angles can be negotiated with practically no increase in power. The movement of ashes or coal is accomplished at such a slow rate that noise, dust and abrasion are practically eliminated. Successful tests with the conveyor have been conducted by the Anthracite Institute laboratory in Pennsylvania. Used in connection with an automatic stoker, the conveyor converts the anthracite-burning furnace into a heating system that works automatically, requiring little attention. The system is said to be unusually economical because it permits burning smaller size fuel without the attendant difficulties of handling.



Top, Diagram of Coal Conveyor System; Bottom, Steel Rings That Move the Coal or Ashes

Full-size buds that never open are produced by a new variety of the evening primrose developed by Dr. George H. Shull, of Princeton University.

Anthracite Institute

Princeton, N.J.
P.P.

E. 36 Reference: Bert Poole,
307 W. 8th St.
Los Angeles, Calif.

FAKE STAMPS *that*

Left, Examining Stamp under
Microscope; in Circle, Some
Clever Counterfeits of Valu-
able Stamps



NEXT to the thrill of finding rare stamps comes the excitement of having them appraised. Recently when this happened an expert told the surprised owner most of his stamps were counterfeits.

"But they can't be," the owner cried. "They've been in my family forty years."

"That may be," the dealer returned, "but counterfeiting is older than that. Experts used to be fooled by stamps we know now were imitations."

Authorities say few large philatelic collections are free from fraudulent stamps. In one large collection was a rare group of unused early Australian stamps that had withstood the scrutiny of experts for years. Under ultraviolet light the examiners discerned iridescent scratches across them. They had been canceled with pen and ink by an early postmaster. Later a forger had removed the ink with chemicals, added gum to the backs, and made the stamps look new. They are still valuable, but not worth as much as if uncanceled. Counterfeiting rare stamps is international in scope. Changing the color of a stamp or



"Phantom" Stamps, Never Issued by Any Government, but Bought by Unsuspecting Collectors

adding a letter may increase its value hundreds of times if the fake is not detected. Tourists and uninformed collectors bring

FOOL Collectors

Looking over a Collection of Nothing but Fake Stamps Which, if Genuine, Would Be Worth More Than \$20,000



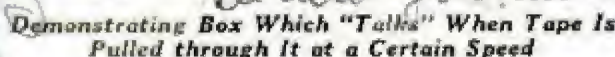
back from abroad stamps that often turn out to be fakes. Wise collectors are afraid to buy stamps at large discounts and purchase only from trustworthy dealers. Often they demand a complete history of a stamp. At least ten per cent of all rare stamps, it is estimated, have been counterfeited, some by as many as twenty different counterfeiters.

"Sometimes a man will fake a whole letter to authenticate the stamp on the envelope," says B. W. H. Poole, philatelist. "The envelope and letter are easier to fake than the stamp but the forger may use ink,

(Continued to page 116A)

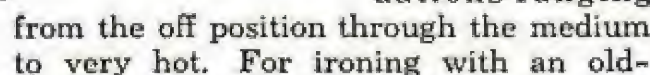


Benzine in a Black Tray Brings Out the Watermarks That Help Prove Genuineness of Stamps



Pulled through notches in a circular sounding box, a "talking" tape gives off sounds that become intelligible to the ear when the tape moves at a certain speed. The box is fashioned to amplify the sound given off by the tape, in the manner of the sound box of stringed instruments. Inexpensive to manufacture, the "talking" box will be marketed as a novelty.

Old-style electrical appliances which have none of the safeguards now built into current types can be modernized with the

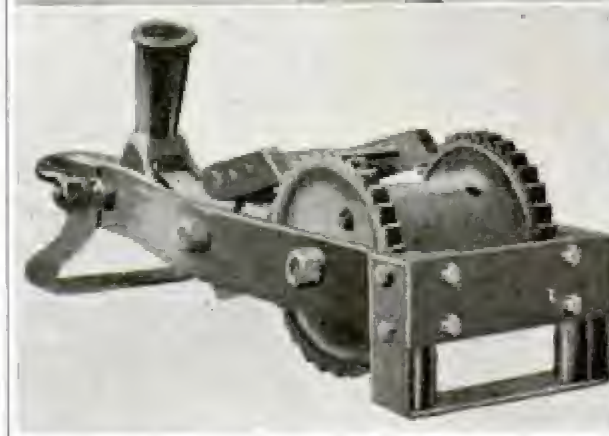


aid of an attachment plug containing an automatic heat-control unit. The plug has six feet of asbestos-covered cord attached to a Bakelite wall plug. The heat indicating dial in the main plug has six graduations ranging

fashioned iron, the dial in the plug is set to the heat desired which will remain constant. In using an old percolator the dial is set at the medium or hot position until the coffee is made, then is retarded to the slow-heat reading to keep the contents at drinking temperature. With the heat-control plug cereals can be cooked safely at night with low temperature at little cost.

282

Designed to exert tremendous power even when operated by one man, a small pulling jack is available for moving or turning houses, ripping out stumps, moving railway cars and other heavy work. On one job, the jack turned a sixteen-room house with only one pulley in use. A loaded coal car can be moved easily by one man with the tool and three or four loaded cars, on a level track, can be pulled in the same manner. Stump pulling can be accomplished in about one-fifth the time ordinarily required on jobs where no explosive is used.



Top, Jack Moving House; Bottom, Powerful Jack for Performing Various Heavy Jobs

1313 Firestone. Los Angeles
Price. \$1.50

Speed of Landing Plane Shown through Grid

Landing speed and gliding angle of airplanes are determined with photographic equipment developed by the Boeing Aircraft company. It consists of a wire grid, an anemometer and a motion-picture camera calibrated to determine exposures per second. The grid, a large frame with wires evenly spaced, is set up ten feet from the camera. White tape is placed on the field, parallel with the grid, to guide the pilot. As the plane approaches, the camera records the forward motion and the angle of glide while the anemometer indicates the wind speed, which is added to the computed speed to determine the true speed in still air.

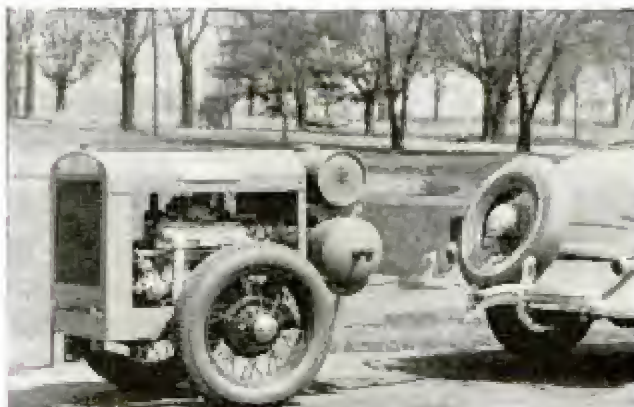


Using Movie Camera to Take Pictures through Grid of Landing Airplane, the Photographs Aiding in Computing the Plane's Speed

Light Air Compressor Is Towed Behind a Passenger Car

No truck is needed to transport a lightweight air compressor so constructed that it can be towed, trailer fashion, behind a passenger car at speeds up to thirty-five miles per hour. The compressor is mounted on two pneumatic-tired wheels and can be had with or without springs. A trailer type of coupling is provided. The unit is complete with air receiver, cooling system,

automatic unloading control and is protected with a steel hood and side doors which can be padlocked. Drop legs support the compressor when in use and one man can pull it about on the job. It is built in two sizes and is particularly adapted for painters, carpenters or contractors having small jobs requiring relatively small amounts of air power.



Lightweight Air Compressor Mounted on Two Wheels so It Can Be Towed Behind Automobile

HEART SOUND IS SEEN, HEARD AND PHOTOGRAPHED

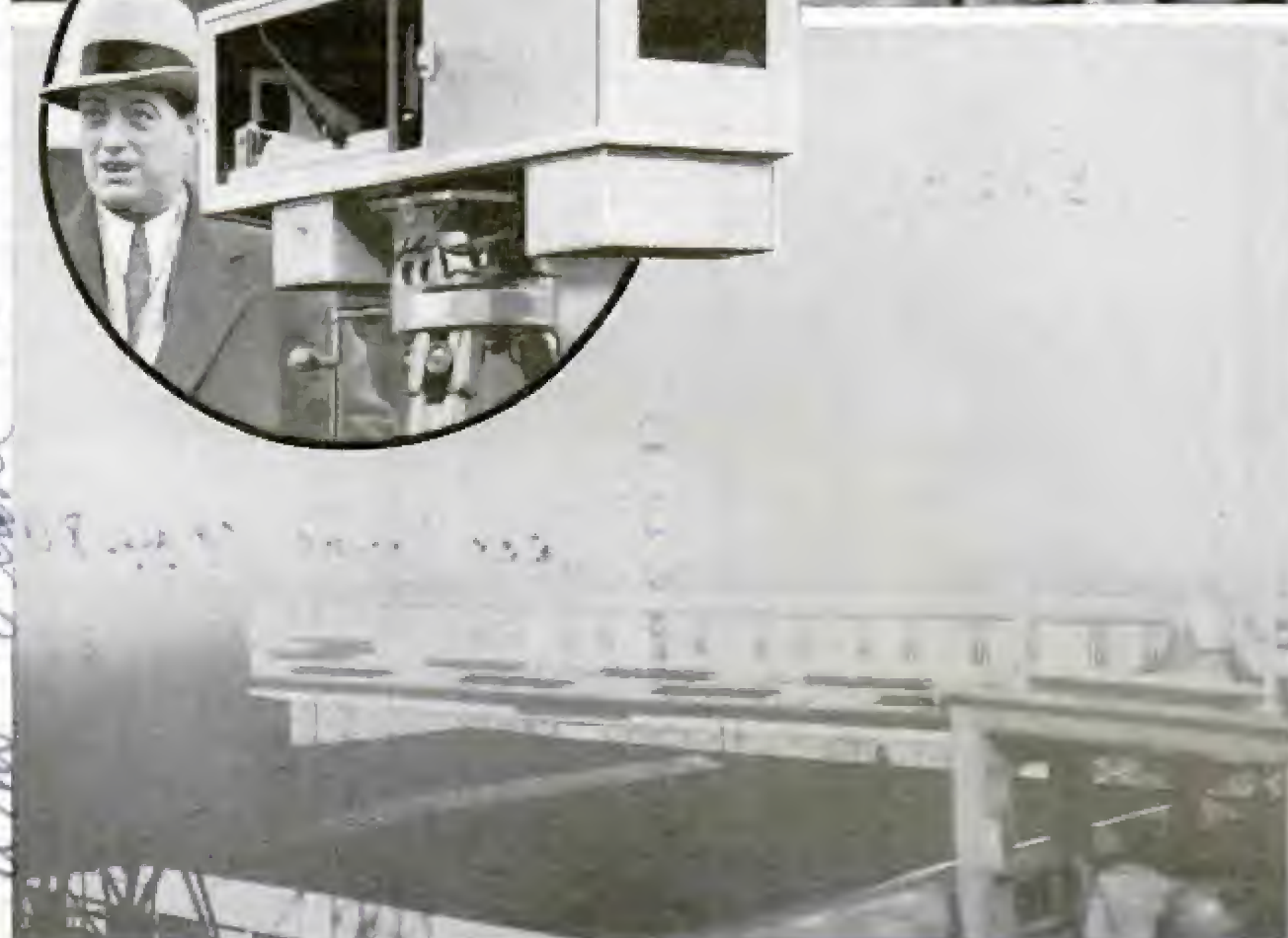
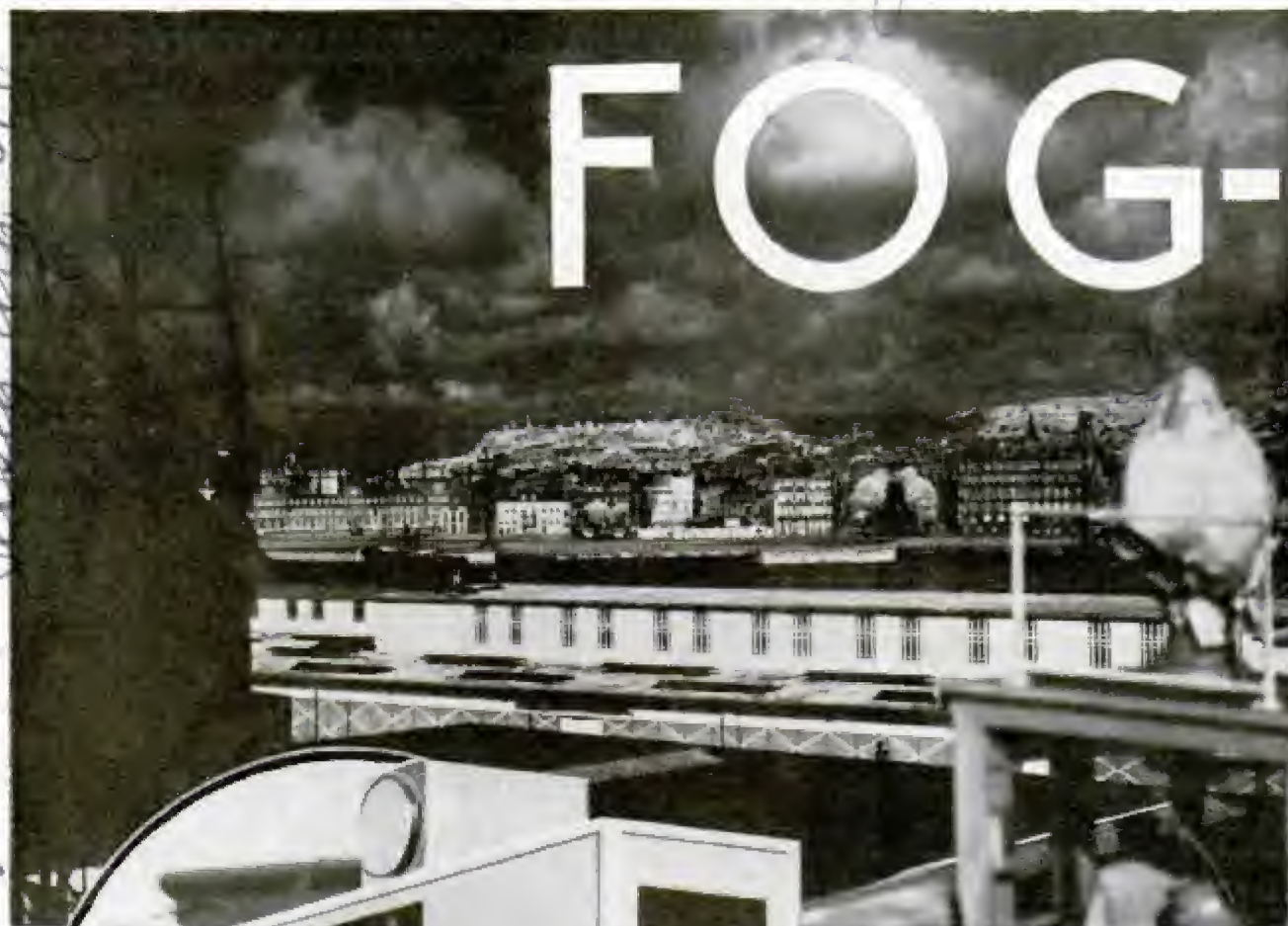
Sounds made by the heart can be seen, heard and photographed at the same time by a method devised by Dr. Walter Biering, president of the American Medical Association, Dr. H. C. Bone and M. L. Lockhart. The work is done by an electro-stethograph. Vibrations of the heart can be seen on a viewing screen at the same time the physician listens to and photographs the vibrations. The photograph provides a permanent record of heart action.

*George H. S. Larson
Seattle Wash
Cambridge Graduate of Brown
N.Y.C. 37 32 Grand Central
made
6.35 A Heartman
Chicago*

*Schramm, chue
P. Leo manes.*

98... Cmr. Don...
 4 W. 10 3rd New York
 1934-56
 Edward W. Williams, Jr.
 Morgan, St. John City, Md.
 no gene 1934-56

FOG-



Fog Camera Used on the "Manhattan," and Photograph, at Top, Taken from Ship's Deck with This
 Fog-Penetrating Camera; Below, Picture Taken from Ship's Deck with Ordinary Camera

A MILLION DOLLAR MENACE



Left, Face to Face with the Tiny Droplets of Water of Which Fog Is Composed; Right, Experimenting with Electric Apparatus Intended to Dissipate Fog in Small Area

A MILLION-DOLLAR fog! A treacherous earth-hugging blanket of water and soot particles that causes collisions, maroons ships, brings down airplanes, delays trains, entangles traffic, doubles fatalities and defeats sunshine.

Early this year a four-day fog on the Atlantic seaboard cost ship operators and passengers a cool million in the first forty-eight hours of its duration. With visibility cut down to "zero-zero," less than ten feet, ship masters would not risk the passage through New York's busy harbor. The result was that twenty transatlantic vessels dropped their hooks off quarantine and waited patiently for the fog to lift.

Large ships, tall ships, tramps and carriers—all were fogbound. Fast refrigerated fruit ships with perishable cargoes from the tropics waited with the rest. More than 140 men were marooned on an island in Long Island sound when ferry boats suspended service. Fifty-two crack pilots

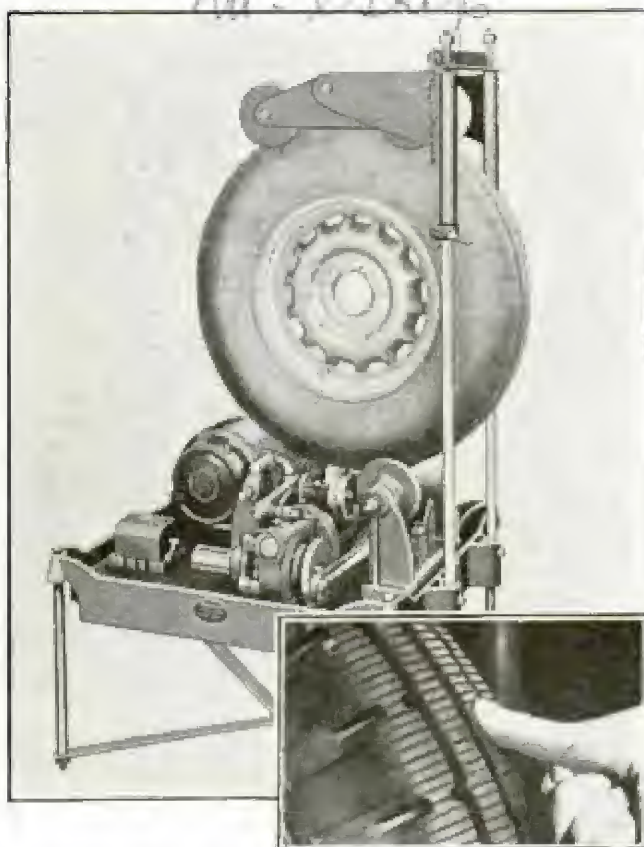
were stranded on ships around the harbor. Thousands of sacks of overseas mail could not be transferred to the waiting mail boats.

When passengers are fogbound in a harbor, there are many disappointments and losses. Men with investments at stake are more than willing to pay nine dollars for three minutes of radio-telephone conversation. Notwithstanding, many business deals go awry. While the passengers lose their patience and money, what of the ship operators with vessels at a standstill and payrolls and insurance and food bills running to tens of thousands of dollars per day?

Fogs must be paid for out of profits. The annual losses attributable to fogs now run to many millions of dollars. For years fog has been a standing challenge to inventors. Lately, the increase in the density and number of fogs is laid to the increase of soot particles in the air around cities.

(Continued to page 128A)

NON-SKID SLOTS CUT ON TIRES BY TREAD MACHINE

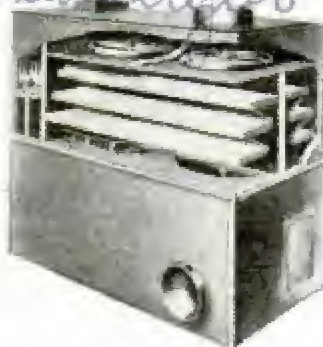


Machine Cutting Slotted Tread on Old and New Tires; Inset, the New Tread

By cutting a series of fine slots transversely on the tread of the automobile tire, a new machine minimizes the hazard of skidding. The small slots grip the road better than the ordinary tread, eliminating much of the danger on slippery streets. It can be applied to old or new tires.

SUMMER AIR COOLED BY UNIT THAT ADSORBS MOISTURE

Using the adsorption method of dehumidifying, a silica gel unit cools the summer air. Silica gel is a hard substance, similar in appearance to clear quartz granules, but extremely porous. Moisture from the air brought in contact with this substance is soaked up, the process being like the action of a sponge. The unit consists of silica gel supported in compart-



ments, fans to convey the adsorption and reactivating air through the beds, a heater, motor, cooler and automatic controls. For continuous operation, the silica gel compartments are connected to suitable ducts and rotating valves by which the air stream or heated activation air is alternated from one silica gel compartment to another at ten-minute intervals. Once dehumidified, the air is cooled by surface-type coolers.

£210

PHOTO MADE IN HALF MINUTE IS COMPLETE TO FRAME

Snapped, developed and printed in less than thirty seconds, photographs are delivered complete with frame by a new automatic machine. The person sitting for the photograph simply drops a coin in the slot and pulls a lever. The shutter clicks, a motor whirs and in one-half minute, a circular, metal-framed photo rolls out. Developing and fixing liquids are applied to the photographic paper automatically. Motor-driven cams operate the shutter.



Photography Booth; Below, Framed Photo Which Camera Delivers in Half Minute

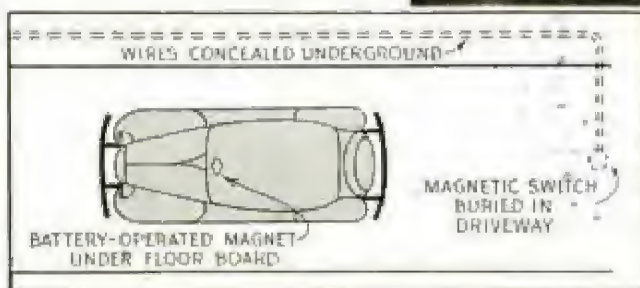
Bryant Heater Co
1780 E 1st St. Cleveland, Ohio

Photomatic Corporation
of America, Cleveland, Ohio

1417 Avenue Street Bldg.

Garage Doors Opened from Car by Magnet

Garage doors can be opened or closed without leaving the car with the aid of a positive-action magnetic apparatus said to be less liable to get out of order than the automatic devices operated by electric eyes or radio waves. The operating unit consists of a one-sixth horsepower motor, connected to the lighting

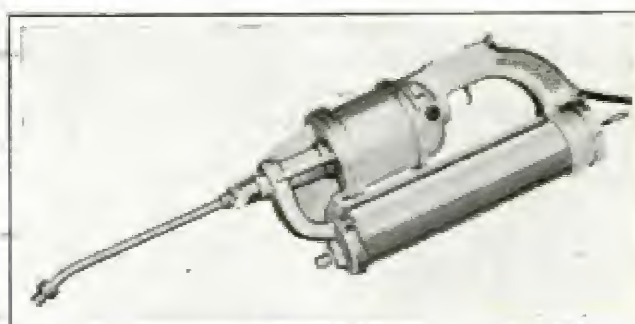


Rods Which Open or Close Garage Doors, and Diagram Showing Location of Magnetic Switch

circuit and having a friction drive. This drive is overhead in the garage and is connected to swinging doors by a simple combination of push rods and driving arm. Slight alterations adapt the hook-up to overhead doors. Buried in the roadbed of the driveway, in a location known only to the owner, is a positive operating magnetic switch wired to the motor in the garage. A special magnet, operating on the car battery and using little current, is installed beneath the floor boards of the auto and is actuated by a push button. A press of the toe on this button as the car passes over the buried magnet causes the apparatus to open or close and lock the doors and switch the lights on or off. Other control buttons are located in the garage and house for closing doors and turning off the lights after the car has entered. A hand switch disconnects the lights when they are not needed and no separate locks are required on the doors. The doors can be disconnected and operated manually.

Electric Grease Gun Works without Air Pressure Line

Independent of air lines and compressors, a new electric grease gun plugs into any light socket. Various attachments adapt it to handle any pressure grease on any type of fitting. The gun operates at the touch of a trigger and stops instantly when the trigger is released, resulting in a saving in grease. A cam at the end of the gun's motor shaft actuates four small pistons which force grease into the compression chamber. This builds up pressure which is maintained by four ball check valves. Weighing only six pounds, the gun gives 40,000 tiny shots per minute, amounting to a continuous flow at the rate of one pound per minute. The trigger is so sensitive that it can release one drop at a time or a steady stream of grease.



Latest Grease Gun Has No Air Line; It Is Operated by Electrically Driven Pistons

Weaver Mfg. Co. Springfield



Cage at End of Coach Is Used to Confine Prisoners Being Transported on Railway; It Is Portable.

PRISON CELL FOR RAILWAY CAR IS AID TO GUARDS

For installation on passenger coaches in which state and federal prisoners are transported, a special cage has been developed by a middle western railroad. Placed in a fixed position at the forward end of the car, the cage is virtually a traveling prison which segregates prisoners from regular passengers. The wire mesh has a door in the center which is locked when the officers and their charges enter. Easily portable from one car to another, the cage makes it unnecessary for guards to watch the doors to prevent escapes while the train is in motion.

CALCULATOR SPEEDS UP WORK BY SOLVING PROBLEMS

Quickly giving the answer to hundreds of mathematical problems, a handy calculator speeds up office work. It does not add or subtract, but

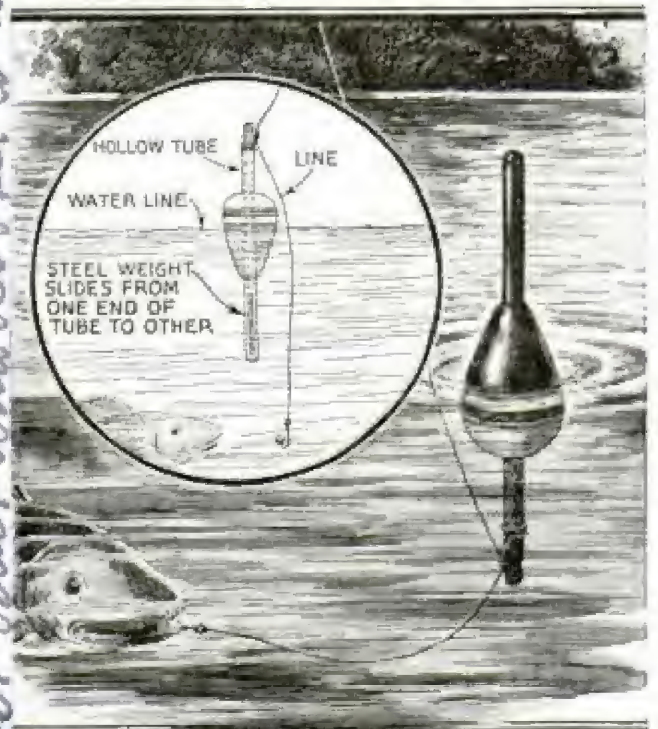


solves problems in multiplication, division and proportion, using two outer scales and two transparent indicators. Three inner scales are

used for problems in interest and for determining the number of days between any two dates. The calculator will figure exact cost prices on individual articles and the correct selling price to make any profit desired with any per cent of overhead.

FISH TURNS BOBBER OVER WHEN IT BITES

Constructed so that the slight pull of a fish nibbling the bait will turn it upside down, a new bobber quickly signals the fisherman. It is claimed that one-third of the pull necessary to submerge ordinary bobbers will upset the new type. It consists of a celluloid tube running through a cork. Inside the tube is a weight that slides from one end to the other when the bobber is upset. Placed in the water in its regular position, the bobber will ride until the fish bites and turns it over. Upon being upset, the bobber changes color, one end being painted white and red and the other end red and black. Thus, the fisherman is not obliged to watch the bobber constantly to know when he has a bite.



Weighted Bobber Turns Upside Down When Fish Bites; Inset, How Bobber Works

Double-Sail Boat Is Fast and Easy to Handle



Two Views of Revolving Mast Boat; Odd Design of Sail Eliminates Boom and Stays; Sail Area Is Twice That of Conventional Sail, Resulting in a Considerable Increase in Speed

Eliminating boom, stays and foresail, a new double-sail arrangement speeds up sailboats and simplifies their handling. A feature is a revolving mast on which the mainsail is wound like a window shade on its roller. To reduce sail area, the navigator simply turns a wheel in the cockpit and rotates the mast by a system of ropes. The mainsail is double, with a triangular shape. Running before the wind, the double sail opens out into what looks like a great parachute jib sail. For tacking into the wind, one sail lies smoothly on top of the other. The forward edge of the sail is fixed in a slot on the bow side of the mast so that there is no gap between mast and sail. The only stay on the boat is a tiny wire running from the tip of the mast to the stern of the boat, yet the experimental craft has been operated in heavy weather with good results. There is no boom. So fast and so easy to handle, the double sail-boat may bring about a change in yacht racing rules which do not permit the use

of a revolving mast. Sail area of the first boat of its kind is about 10,000 square feet when the two sails lie one on top of the other, as in tacking. Running before the wind, the sail area is 20,000 square feet.

DRAWINGS MADE ON ALUMINUM FOR PERMANENT RECORDS

Paper, when used as a permanent record for drawings of any extreme degree of accuracy, is unsatisfactory because it shrinks and expands enough so that the accuracy of any work plotted on it is only temporary. As a result aluminum sheets are now displacing paper for this purpose. British surveyors are using aluminum plates on which to engrave plans which they desire to keep accurate permanently.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Aluminum News Letter

Science Service

Aluminum Co. of America, Inc. 100 Broadway, New York, N.Y.

Pittsburgh, Pa.

D/411

Frederick C. Russell,
115 Walbridge Road
Harvard, Mass.

Keeping



Top, Analyst Shows Motorist Exactly What Is Wrong with His Car by Making Test and Then Pointing to Indicator; Bottom, Special Leakage Gauge Tests Cylinder for Compression

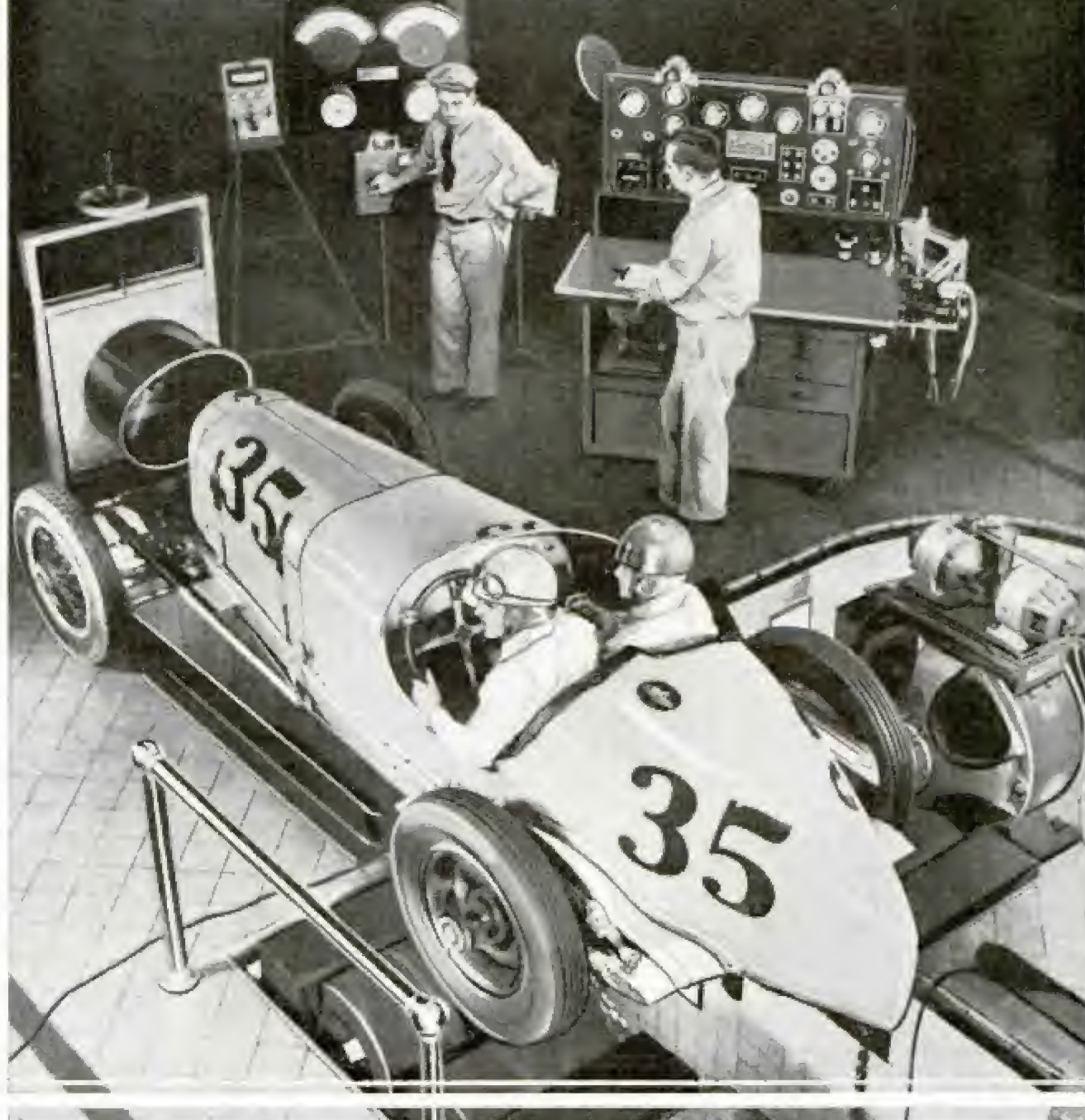
IT'S a long stride from the lone mechanic with his monkey wrench and screwdriver to the modern service laboratory with its ingenious fact-finding and fault-correcting equipment. So revolutionary is this change that the few tools once the mainstay of mechanical first-aid now seem like crude implements of the stone age.

A few years ago brakes were adjusted by taking up on the rods and then trying the car on the road to see which of the two rear wheels slid when the brakes were applied. If the front wheels were not in alinement the owner found out when front

tires started to lose their treads. If a car would not go over a test hill in high gear the motor suffered from low compression or faulty ignition, service men guessing their way through to some sort of conclusion. To advance spark timing a repairer turned the distributor head until the motor knocked a little when accelerated rapidly. It was all crude, but it was the best the industry offered and all the motorist felt he could

expect. Today nothing is left to guesswork. So systematic is the modern alinement and balance checkup that even a weak spring or an unbalanced tire can't get by. Service engineers do not stop with accuracy in gauging the correctness of toe-in, camber and caster but go to the root of any evidences of inaccuracy. Toe-in and turning radius, for example, often are affected adversely by an error in the spindle arms. Both spindle arms must check alike. The slightest bend in either arm has a marked effect on toe-in. If the tie rod is changed without a knowledge of whether the spin-

YOUR CAR FIT



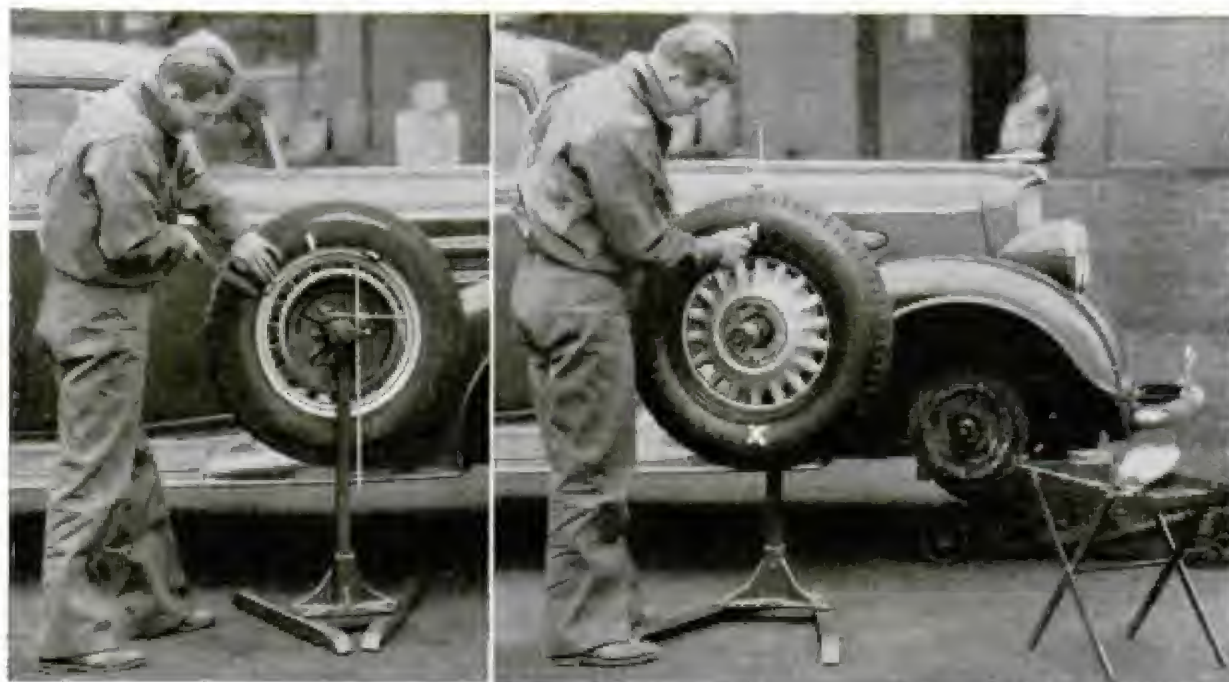
Fred Frame with His Car Traveling 120 Miles per Hour on Special Testing Machine; Car's Ability at Any Speed and Road Load Is Determined without Moving the Racer

dles are bent, the turning radius is thrown off, but today's master mechanic makes no such mistake.

Working with odd tools this new-day service man succeeds in keeping the modern car in trim. Unusual are the telescoping measuring rods for use in checking for slipped axles. To find out if the front axle is at the correct position on the spring saddle he measures the distance on each

side from the center of the front spring bolt to the axle. To locate twists and to level spring beds he uses a special magnet gauge. An unusual tool is the patented tracking gauge used for checking the measurement from spindle center to rear-axle center. This tool locates a swung front or rear end, as well as a swayed or a diamond-shaped frame. The heaviest axles are handled easily in straightening opera-

Balancing the Wheels Makes Auto Driving Safer



Two Views of Wheel-Balancing Machine; Right, "X" on Tire Marks Spot Where Small Weight Should Be Attached to Balance Wheel for Smooth Running

DO you know that a thirty-inch automobile wheel off balance one ounce creates a centrifugal force of eleven pounds at sixty miles an hour? Yet, the average wheel is off balance five and one-half ounces! Not infrequently, we are told, speed demons drive with both front wheels misbehaving up to fourteen ounces for, today, out-of-balance wheels are the rule, not the exception!

Jack up the wheel on your car, give it a spin and it will revolve about fifty-seven seconds. Heavy, stiff grease, felt

grease retainers and brake-band drags, all tend to retard velocity.

Take that same unbalanced wheel, mount it on a wheel balancer and it will revolve eight minutes, two seconds. Balance your wheel, now spin it. It will revolve nine minutes, four seconds, by stop-watch tests.

The wheel-balancing machine is simply an accurately machined shaft, mounted in ball bearings which are floated in the lightest of oils invented for the purpose of discovering individual car ailments.

tions with the aid of the very modern bending tool.

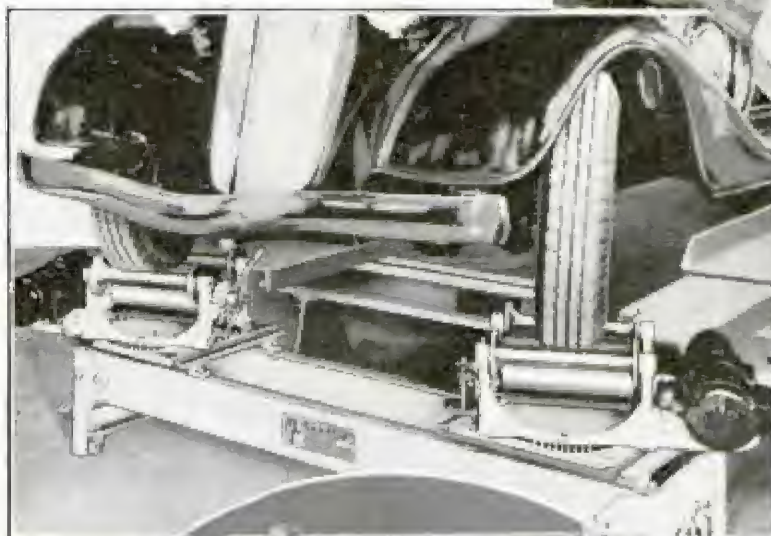
It seems but yesterday when the first step in locating ignition trouble was to "short" out each spark plug with the aid of a screwdriver. The idea was to find a plug that made no difference in the running of the motor. No difference meant that it wasn't firing. Crude spark-plug testers were used to study the behavior of each plug, but since these were located on the workbench there was no way of knowing how the plugs would behave when firing under compression. Especially crude were the methods used for adjusting the breaker points and timing the motor.

Now the first thing a progressive car owner does when the engine falters is to visit a service laboratory to have the motor analyzed. In fact, he has this done regularly so he can be certain he is getting full value from his car and the fuel he buys. Systems of analyzing vary, but before a service engineer has finished the test he has a complete picture of the condition of the motor. Each cylinder is checked for compression, and any evidence of lowered compression is quickly traced to poor seating valves or to leakage around the piston rings. A special instrument tells the efficiency of the fuel pump. The distributor is removed from the car and given a system-

atic checkup. Adjusting and synchronizing the points looks like a lesson in navigation as the service engineer checks the degrees of opening and closing.

Neon lights are used for synchronizing points and the spark timing is then checked by a Neon light timed to flash in step with the revolutions of the flywheel with the motor running.

Nothing is left to chance. Even such details as the tension of the breaker-arm springs are considered. Alinement of points comes



Top, Operating Spark-Plug Tester; Center, Checking Toe-Out on Curves; Bottom, Wheel Straightener

service man reverses matters by doing his checking at the exhaust. With the motor running, samples of exhaust gas are recorded for reading by the analyst. If the mixture checks too rich he makes changes in the carburetor adjustments, but he does not blame the carburetor for all that is wrong with the exhaust until he has checked for skipping spark plugs, poor seating valves, weak ignition, oil pumping and any other mechanical or electrical condition that would affect motor efficiency.

Because deficient braking systems continue to cause accidents every effort has been made in developing equipment that will keep brakes braking safely. Typical is the finding in Chicago and Memphis where sixty-three per cent of the cars in service had unsafe

in for attention, while condenser and coil tests are exhaustive.

It once was the custom to warm up the motor and then fuss with the gas and air in adjusting the carburetor. Today the

brakes. The situation is especially serious because many owners do not realize that they are courting danger.

Most of the difficulty with today's brakes

(Continued to page 132A)

Cities Service Oil Co. Chicago
101 S. Western Ave

Plane Locates Source of Radio Interference



Diagram Shows Flight of Plane in Locating Source of Radio Interference; Numbers Indicate Readings

Another use recently was found for the airplane. With its aid the source of radio interference can be traced quickly and accurately. In the vicinity of the Newark, N. J., airport, a virtually steady buzz blocked out all but the strongest signals of the broadcast and short-wave bands, and investigators spent ten days in cars touring the territory with receivers used for tracing such interference without success. Finally Guy Newell, radio operator for American Airlines, whose radio broadcasts to planes were affected, suggested that a plane fly over the territory with equipment for tracing the radiated interference. A course of flight over suspected places

was mapped out and the investigators checked locations and meter readings as the plane covered the territory. The source of the trouble was located at a point directly between the two highest readings taken. It was due to a switch on a railroad signal circuit which was improperly closed.

"REBUILT" GASOLINE PROVIDES MORE POWER FOR PLANES

By using a "rebuilt" gasoline with 100 octane anti-knock rating, the army has found a way to increase the power output of airplane engines by a sixth to a third without increasing the weight of the fuel used. Experiments with this special lead-blended iso-octane gasoline have demonstrated its superiority over the ninety-two

Newark Airport
Newark N.J.

Science of engine 1/30/35

octane gasoline now used, according to army officials. This means that with engines designed for the new fuel, army planes can fly farther and faster without carrying added weight. By using this fuel army planes will deliver about seventy per cent more power per pound of gasoline than was possible eight years ago. Synthetic gasoline must be made to obtain the high octane rating. Petroleum is still used as the raw material but the molecules are broken down and rebuilt to form the new fuel. Iso-octane is the chemical compound used as a standard in testing the anti-knock qualities of tetraethyl lead and other gasoline additions and the new fuel is composed half of iso-octane and half of aviation gasoline with ethyl added.

PASSENGERS CARRIED UP HILL BY INCLINED ELEVATOR

Passengers are carried from the seashore to the top of a steep hill on a ranch near Santa Barbara, Calif., by means of an inclined elevator which travels a distance of 158 feet and stops at the terminals only. It has a capacity of 1,800 pounds, travels 100 feet per minute, and is operated on alternating current.



Inclined Elevator Used to Transport Passengers Up and Down a Steep Hill on a California Ranch

ANY PICTURE IS EASY TO COPY WITH SIMPLE REFLECTOR



Tracing a Picture Projected on Paper by the Inexpensive Reflector Machine

Photographs, pictures, magazine covers and objects can be copied in pen and ink, pencil, paints or crayons and etching materials by using a simple reflector now on the market. The device enlarges, reduces or reproduces all lines and colors faithfully. The operator simply draws or traces right over a direct reflection of the picture which appears in correct proportion. Easy to use, the reflector plugs into an electric outlet. The lens is adjustable for reduction or enlargement and for proper focus.

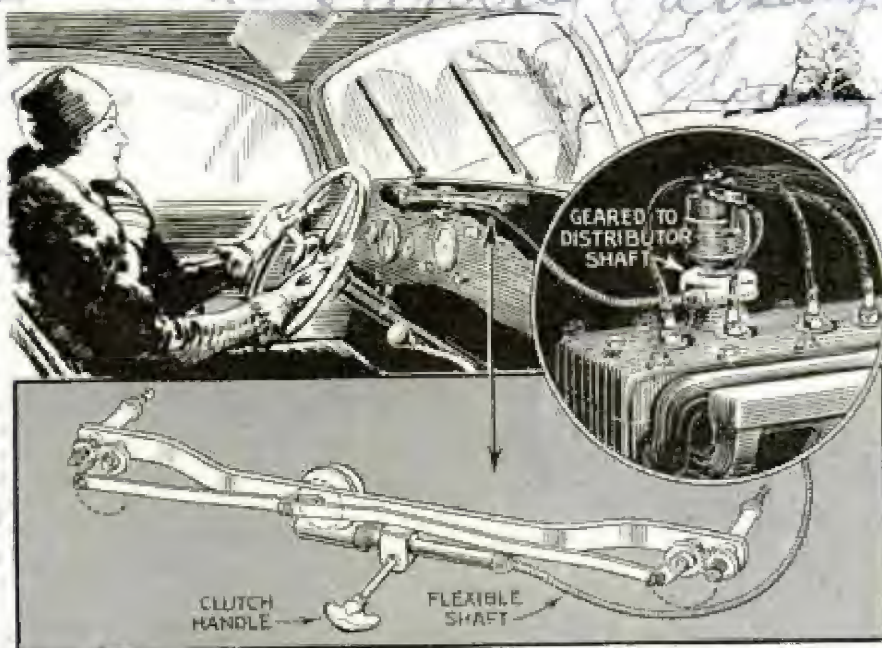
LATEST METAL HAS HARDNESS AND HEAT RESISTANCE

Combining the strength and hardness of alloy steel with exceptional resistance to corrosion and heat, a new metal has been made available to manufacturers. It is called aluminum-monel metal and is much like monel metal, with four per cent aluminum added. It is especially useful for turbine blades and pump rods.

Of the 109 glider pilots in the United States, three are women.

Mr. W. A. Mudge, Hunter, N. Y.

Handwritten notes on the right margin include: 'A. B.', '4/12/39', 'New Products Corp', 'W. 28th St', 'New York', '205', 'Covers', 'Wall St', 'michel', 'new York'.



Sketch Shows How Auto Manufacturer Would Install New Mechanical Windshield Wiper; It Is Driven by the Engine

WIPER DRIVEN BY AUTO ENGINE HAS GREATER POWER

Designed to be driven by the automobile engine, a mechanical windshield wiper is ready for incorporation into auto, truck, bus, snowplow and other vehicles. The positive drive gives the wiper greater power to clear ice and snow from the windshield. It will be necessary for automotive manufacturers to cut a drive gear on the shaft from which the take-off works. A flexible driveshaft, similar to a speedometer shaft, runs from distributor shaft or cam shaft to the lower edge of the windshield, passing through the underside of the dash. A dash control permits the driver to start and stop the wiper.

LATEST PEN REFILLS ITSELF BY CAPILLARY ACTION

From a bottle containing a year's supply of ink, the pen of the latest writing set refills itself by capillary feed. Thus the pen is always inked and ready to write as much as two pages without redipping. The ink bottle is screwed in inverted position into the base of the set. As the bottle is inverted, the ink does not spill but



the capillary feed-rod in the bottle slides into place in the center of the well. Then the pen is placed in a close-fitting funnel and begins to fill itself. By actual test, the ink goes twice as far as that in ordinary wells because none is lost by evaporation or oxidization.

TRAPDOOR IN WAR PLANE PERMITS 'CHUTE JUMPS

Parachute jumps in emergencies can be made by the machine gunner in the latest French fighting plane. A trapdoor on

which the gunner stands can be opened to permit his escape if the ship should become disabled in action. The parachute would carry the gunner clear of the plane. The trapdoor was a feature of one ship on exhibition in Paris recently.

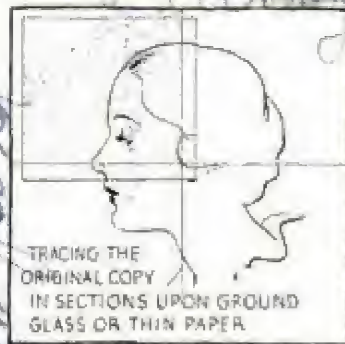


War Plane Has Trapdoor for Emergency 'Chute Jumps; Note Door in Open Position

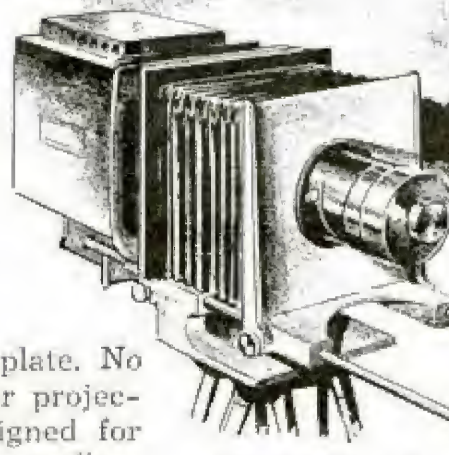
Com. Wilkins

Projector-Camera Makes a Photo or Tracing

Any object visible to the eye can be photographed or traced by a combination machine equipped for projecting the reproduction any size upon screen, wall or other surface. It is fitted with sufficient bellows to allow small objects, such as lodge pins, to be traced or photographed actual size and larger upon the slide for projection. The lamp house is detachable by removing the hinge pin, making an excellent spotlight to illuminate the copy for tracing or photographing. The machine will make pounce patterns from two inches square to full bulletin size, ten by fifty feet, and to fit any space to the fraction of an inch. Reversing is accomplished by turning the tracing or lantern slide plate. No dark room is necessary for projection. The machine is designed for making original sketches, as well as for reproducing them on the job later.



SWING LAMPHOUSE INTO PLACE, SWITCH ON LIGHT AND ENLARGE OR REDUCE SUBJECT TO DESIRED SIZE



Sketches Show How Projector-Camera Is Used for Enlarging Photographs or Drawings

Non-Leaking Water Faucet Uses a Double-Seal Valve

Intended to stop the flow of water before the valve is fully closed, a non-leaking faucet valve provides a double seal. Water enters the open valve from below and is forced upward through narrow slots in the valve stem. These slots run within a fraction of an inch of the head so that the flow of water is stopped by a surrounding bushing as the valve is almost closed. When fully closed a leather packing in the seat provides the second



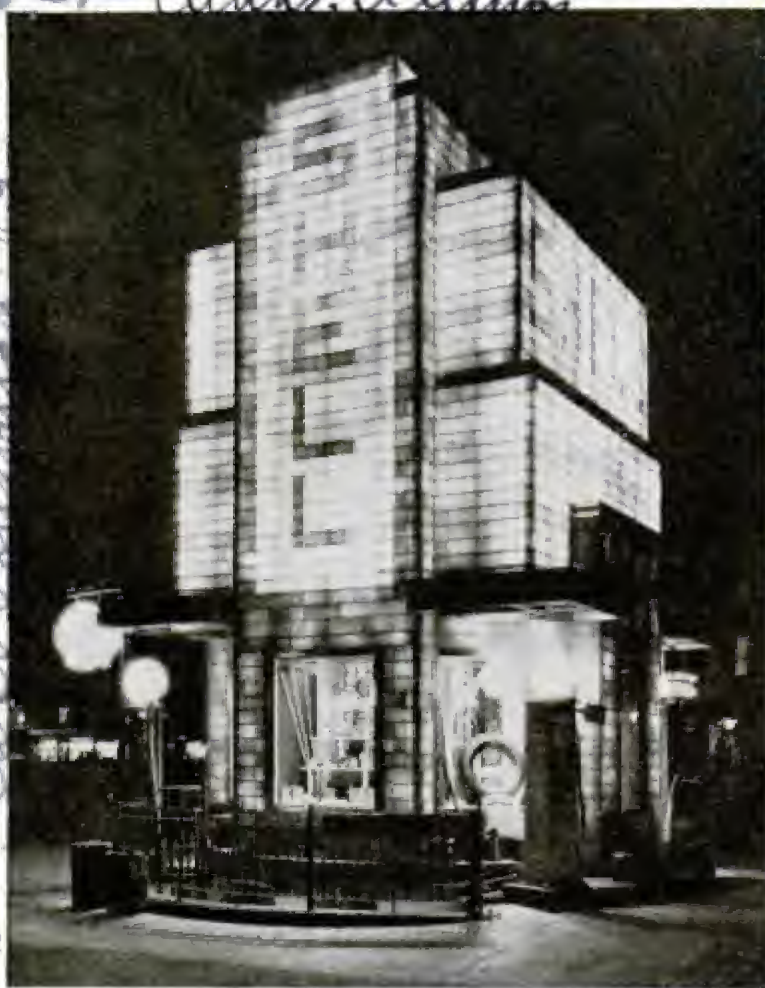
seal. An empty passage in the upper half of the valve body allows waste water to drain, eliminating danger of freezing.

OPEN HEARTH STEEL MAKING DWARFS BESSEMER OUTPUT

Bessemer converters, which supply the spectacular glare of steel making, now produce only a small portion of the nation's steel. In 1924, open hearths produced ninety per cent of the total, as compared to the open hearth output in 1875 of only two per cent. The drop in consumption of Bessemer steel is attributed largely to the demand for "tailor-made" steels which are produced by more flexible methods.

Handwritten notes:
 6749
 8206
 8290
 and Steel Institute
 350-5th Ave
 New York
 Fred J. Walter, 518 Court St.
 Dan Bernardino Calif
 From Steel Facts
 sub 435

Handwritten signature: Dr. J. M. L. Loetscher



Night View of Glass-Walled Filling Station, Showing Effective Illumination Made Possible by This Type of Construction

LIGHTS BEHIND GLASS WALLS LATEST IN BUILDING

Direct or indirect illumination of glass-walled structures, one of the latest trends in the building industry, is increasing rapidly. A building of this type, given translucent lighting treatment, appears with luminous walls at night, standing out clearly from its surroundings. An example of this work is a Shell Oil company station in New York. The hollow glass wall, six inches deep, is backed by wall board painted white. Ten and fifteen-watt lamps are used to produce a highly decorative effect. Structural glass is now available in bricks, moldings and other forms.

WINDOW IN DIESEL ENGINE SHOWS HOW FUEL BURNS

High-speed photographs of fuel oil burning in a Diesel engine cylinder have been taken through special heat-resistant glass windows inserted in the wall of the cylinder. New facts which are expected to ad-

vance the possibility of using Diesel engines in aircraft have been revealed. Motion-picture film, taken at the rate of 2,500 frames per second, shows that combustion occurs after fuel fills the cylinder, upsetting previous views that the oil began to burn as soon as it came in from the jets. The characteristic feature of the Diesel engine is that the fuel is injected into the air of the cylinders which has been compressed previously by the stroke of the piston. Under compression the air temperature rises until it is high enough to ignite the injected oil, no electric spark being necessary.

POWER BICYCLES RENTED IN NEW BUSINESS

Renting power bicycles has been developed into a thriving business by a Florida inventor who has designed a driving drum that will not slip in wet weather. The drum rides against the rear tire. It is made of a special material that provides a positive grip on the wet tire. A three-quarter horsepower engine drives the bicycle at a speed of thirty-five miles per hour, operating 120 miles on a single gallon of fuel.



Bicycles with Motors Parked in Front of Rental Business; Inset, Location of Motor

ONE-RUNNER "SNOWPLANE" IS STEERED BY BENDING BODY

Snowplaning is taking its place with coasting and skiing as a winter sport. The "snowplane" is a cross between a ski and a sled, consisting of a twelve-foot single runner on which are mounted handle bars and a saddle. The runner is wider than a ski but the tip is tilted like a ski. Curved grooves in the runner make it possible to steer by bending the body while going down hill.



Snowplane Consisting of Single Runner with Saddle and Handle Bars; It Is Steered by Bending Body

PASTE APPLIED TO PAINT REMOVES IT QUICKLY

Paint can be removed quickly and easily with the aid of a paste which is designed for outside work and which takes off virtually all traces of old coats in preparation for a new paint job. The paste is thinned to the proper consistency and then applied with a brush. The paint loosens in a few minutes and is peeled off with a scraper, coming loose in long strips. The paste removes any number of coats and leaves the

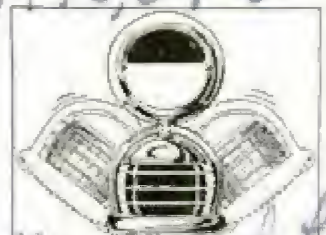


Removing Old Paint with a Paste Which Is Applied with a Brush and Then Peeled Off

wood surface smooth with the putty in nail holes intact. It is claimed the paste method is faster than the blowtorch and no secondary sanding is required, a simple wash removing all traces of the paste.

AUTO STOPLIGHT WIGWAGS WHEN BRAKE IS APPLIED

Wigwagging its warning to stop, a combination tail-light and stoplight operates when the automobile driver steps on the brake. The upper part of the combination unit is a stationary red tail-light. The lower light, visible from both sides and the rear, is a lantern-shaped stoplight which swings to and fro upon application of the brake. The combination is vacuum operated and requires no more electrical energy than the standard tail-light and stoplight. The moving signal increases the safety factor as it attracts more attention than a stationary light.



Los Angeles, Calif.
Burriss Collins
5532 Cottage Grove in Chicago
1,976,543
Dual Stoplight
Patented
5045

exterior use only

William Imperial Co

Latest HOME



Left, Simple Device for Crushing Ice Cubes Makes Use of a Spring Arrangement Which Permits Holding the Ice Firmly; Concealed in the Spring Is a Series of Spikes; When the Handle Is Pressed, the Spikes Chip and Crush the Ice



Left, Room Ventilator Fits at Top of Window; One View Shows Ventilator in Contrast to Old Method That Permitted Shade to Flap; the Ventilator Does Not Interfere with Opening and Closing of Windows; Above, Top for Cleaning-Fluid Can Contains Pad That Is Moistened by Turning Knurled Ring; Turning the Ring in Opposite Direction Shuts Off the Fluid and Seals the Can; Below, Adjustable Chair Has Footstool; Its Fabric Is Waterproof



Below, Attachment for Coffee Percolator Protects Glass Top by Deflecting the Hot Liquid Downward; the Device Also Spreads the Water Evenly over Coffee to Speed Up Percolation



ACCESSORIES



Above, Electric Presser Plugs Directly into Socket; After Two or Three Minutes, It Is Removed, Hot Enough to Press Two Pairs of Trousers; Both Sides of a Garment Can Be Pressed at the Same Time; the Presser Has No Wires; Thermostatically Controlled, It Cannot Overheat and Cannot Scorch; the Device Operates on Alternating Current

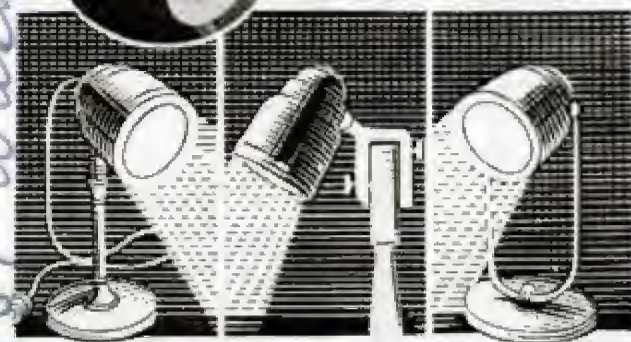


Top, Small-Size Fur Glazer That Operates on A.C. or D.C. Electricity; It Will Not Singe Fur; by Removing Wire Brush, the Glazer Also May Be Used for Ironing Small Articles of Clothing; It Is Lightweight and Easy to Operate; Bottom, Portable Electric Cabinet That Is Wired with Several Cords to Fit All Appliances; the Cords Automatically Roll Up into Compartments When Not in Use; a Special Device Eliminates Fuse Troubles Regardless of Load; Top Is Heat-Resisting and Shelves Are Stainless Steel; Cabinet Is Available in Several Sizes



Novelty Wood Screen, Threaded Together with Wire, Can Be Rolled into Small Space or Shaped to Fit Any Corner; It Is Modern in Design and Lightweight





Several Views Illustrating Uses of Small Spotlight as Reading Lamp; Inset, the Lamp

SPOTLIGHT FOR BED PLACES BEAM WHERE WANTED

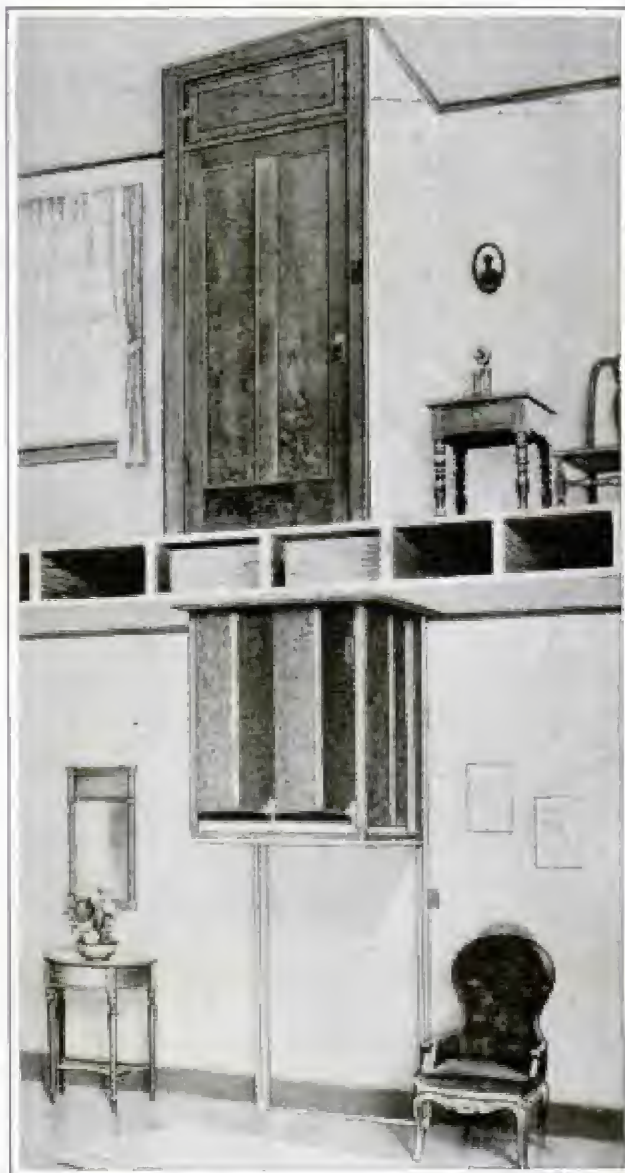
Designed so that its rays will not disturb others in the room, a new lamp directs its beam on newspaper or book. The reflected light from the book gives enough diffused light throughout the room to prevent "contrast glare." The lamp is especially useful for reading in bed, since it will not disturb another person desiring to sleep. It directs more than ten foot-candles of light on the book, magazine or newspaper.

AIRPLANES FIGHT WHEAT FIRES IN RUSSIAN FIELDS

Airplanes are being used to combat fires in Russian wheat fields. Bearing fire-resisting chemicals, the planes fly over the fields a quarter of a mile from the fire line and spray chemicals on the dry stalks. In this manner, fire zones may be laid down in advance of the flames. When the fire reaches the sprayed area, it stops. The chemical is a solution of sulphuric acid and caustic soda. The fire-fighting planes, which have special tanks in the passenger cabin, fly about thirty feet above the ground to obtain best results.

ELEVATOR FOR HOME OPERATES ON HOUSE CURRENT

Operating from the house-current supply, an elevator for the home eliminates the need for climbing stairs and is installed without extensive alterations. The shaft is enclosed on the second floor but no well of any sort is needed on the first floor as the car comes to rest flat upon the carpet. When not in use, it normally is kept on the second floor, but a push button on the first floor brings it down. The upstairs door and the door of the car both are locked when the elevator is in use. It is claimed that if children or animals are on the floor beneath the descending car, it will stop automatically before the weight is sufficient to injure them, thus making it safer to operate without a shaft.



Elevator for Home Which Is Installed without Extensive Alterations; It Operates on House Current

Science Service

1/8/35

Luminator, Inc.

851 Washington Blvd. Chicago

07567 Elevator Co
2413 Colerain

RADIO

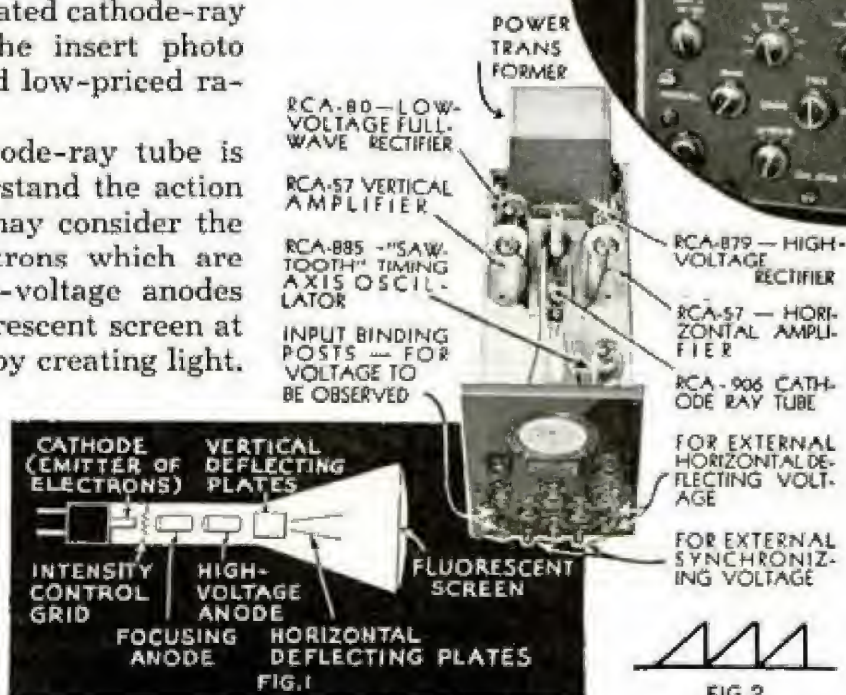
CATHODE RAY Oscillograph *is Portable*

CATHODE-RAY tubes are often called "electron guns" as this describes their functions. They are even shaped like the barrel of an old time blunderbuss. Although well known to laboratory workers for visualizing alternating-current circuit performance, it is only recently that these tubes, and apparatus for their operation, have been available at prices within the reach of radio experimenters, amateurs, service men and students.

Complete with all tubes and ready for use, the portable a.c.-operated cathode-ray oscillograph shown in the insert photo costs no more than a good low-priced radio receiver.

A diagram of the cathode-ray tube is given in Fig. 1. To understand the action of the electron gun one may consider the cathode as emitting electrons which are speeded up by the high-voltage anodes and which strike the fluorescent screen at the end of the tube, thereby creating light. The course of the electrons is controlled by two sets of deflecting plates, one for horizontal deflection and one for vertical deflection. The amount of deflection which controls the

(Continued to page 114A)





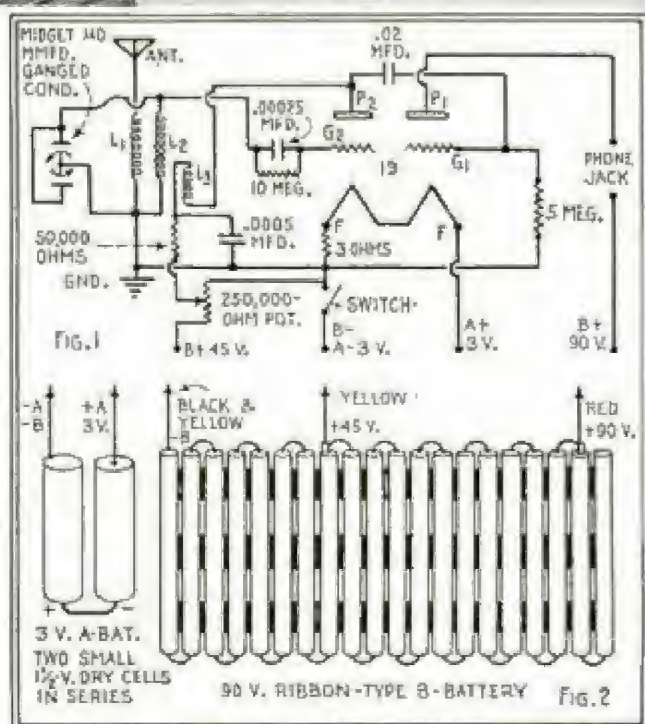
By R. E. DAVY and R. O. LUND

NOW, you can go for a walk and at the same time enjoy your favorite program, or listen in on a detailed broadcast description of a ball game or other sporting event while watching the action. Hikers, boy scouts and campers can make good use of this little, portable receiver. The entire set, including the A-batteries, is contained in a small wooden case hung from the belt. Flexible ribbon-type B-batteries of new design now are available for portable sets of this description. These are

ONE-TUBE

sewed into a canvas belt or may be carried in a patch pocket fastened to the inside of the coat.

A single tube of the dual-purpose variety, known as type 19, is employed in a highly efficient circuit shown in Figs 1 and 3. By careful design, it is made to function as a stable and sensitive regenerative detector and also provide a stage of audio amplification. For local stations the antenna need not be more than 4 or 5 ft. long. This flexible insulated lead rolled up and thrust in the pocket, or sewed into the coat lining, is sufficient to bring in locals with enough volume for two head sets or a small magnetic speaker. The bared end

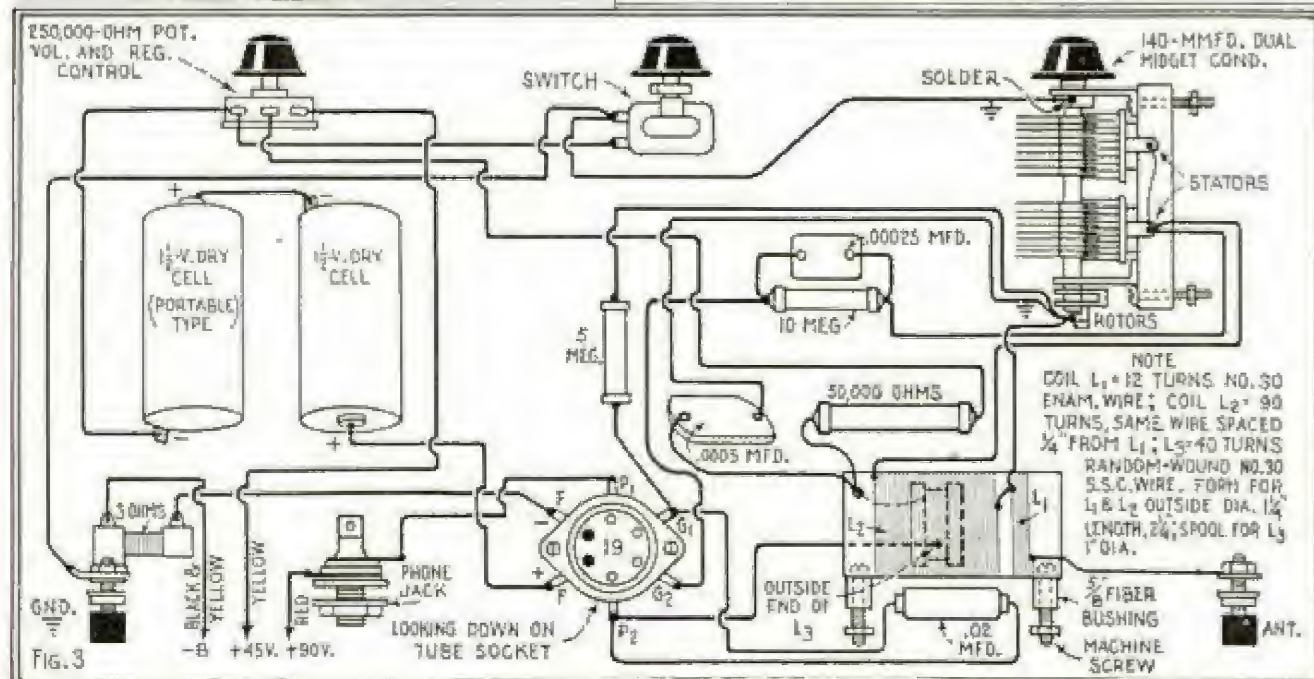
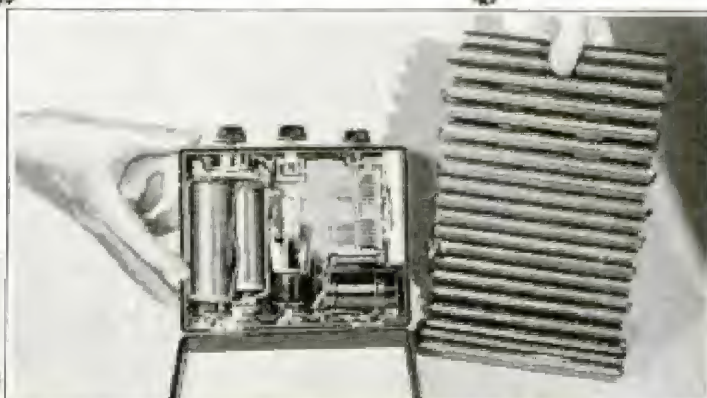


BELT RECEIVER *for Pedestrians*

of the ground lead is held in the hand. For distant stations, many antenna variations are possible; when clipped to a wire fence, distant programs come in with surprising volume.

The 250,000-ohm potentiometer serves as both a volume and regeneration control by varying the plate voltage on the detector circuit. In order to save space and weight, the audio amplifier is resistance coupled. A 3-ohm resistor

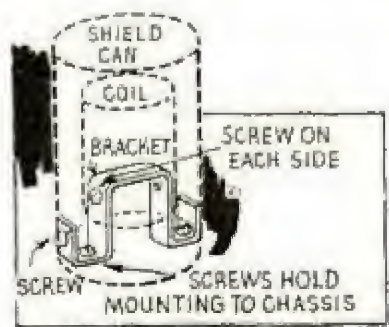
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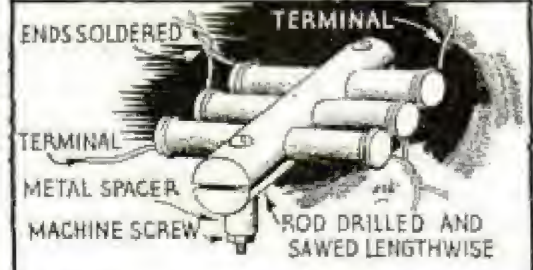
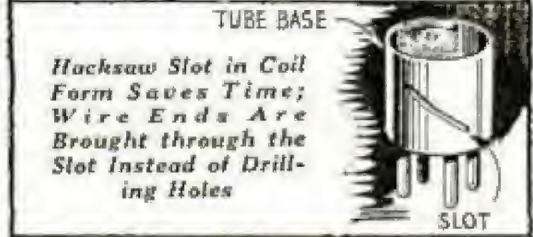
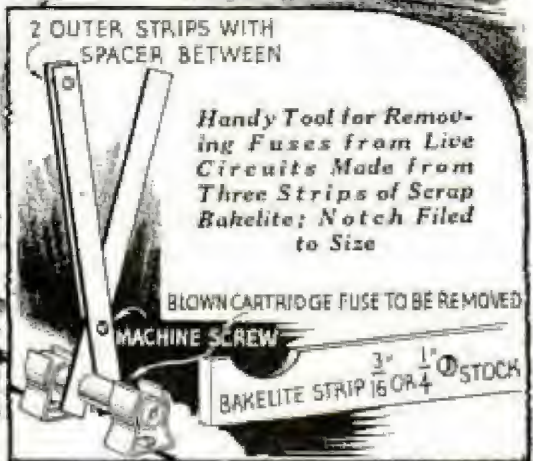
PRACTICAL RADIO *Suggestions*

Low Speaker for Auto Set May Be Installed in the Floor Board of a Sedan for Convenience and Better Sound Distribution; the Speaker Can Be One of the Ordinary Rugged Auto-Radio Types That Is Usually Mounted under the Dash; Its Cable Should Be Lengthened and a Sheet-Metal Cover Placed over the Unit Installed underneath the Floor Board, for Protection and Weatherproofing

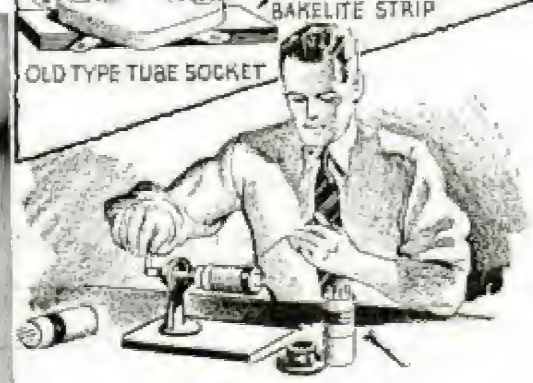


Left, Homemade Coil and Shield-Can Assembly Easily Mounted on Metal Chassis by Means of a Strip of Brass Bent and Drilled as Shown in the Sketch; Mounting Screws Provide Good Ground Connection; Right, Convenient Fixed-Resistor Mounting Made from a Short Length of Hard Rubber or Fiber Rod Clamped to Chassis

Below, Cardboard or Bakelite Tubing Glued to Wooden Plug Inserted in Standard Short-Wave Coil Form to Obtain Necessary Length for Winding Coils in Broadcast Band



Below, When Using Old-Type Tube Sockets on Metal Chassis, Added Insulation May Be Obtained Easily by Raising the Socket to Provide Greater Terminal Clearance

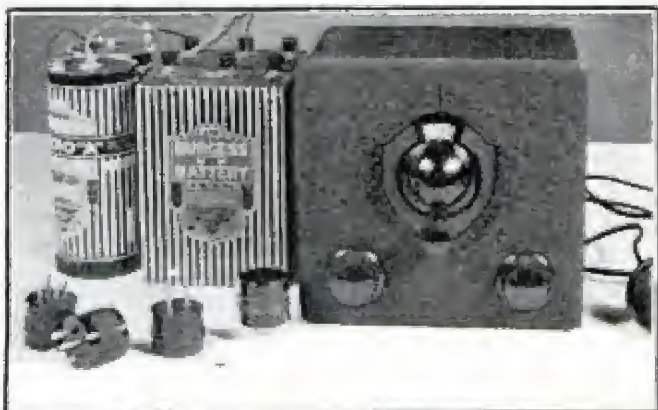


Doerle S-W Battery Receiver for Beginners

ALTHOUGH no unusual circuit is claimed for this inexpensive short-wave receiver, careful attention to design details makes the set a good performer. It will receive code as well as phone, and may be "band-spread" easily for amateur work; coils are available also for the regular broadcast band if desired. Mr. Walter C. Doerle, who originated the model, is well known for his many good short-wave receiver designs.

All construction parts specified are available in kit form for \$4.75. The kit includes 4 coils, tuning from 15 to 200 meters, wound on polished bakelite forms; also a heavy black crystal-finished chassis with all holes drilled. Tubes, batteries and headphones are not included in the kit.

Two type-30 tubes are employed; they draw very little current and may be operated with two 1½-volt dry cells in series, or a 2-volt storage cell. The filament rheostat is shown at the right in the simplified wiring diagram, Fig. 1; a schematic diagram is given in Fig. 2. Note that a fahnestock clip is soldered directly to one

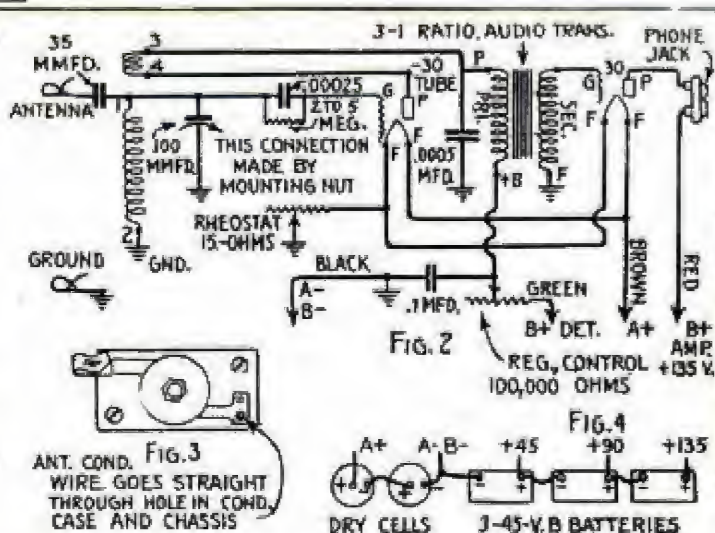
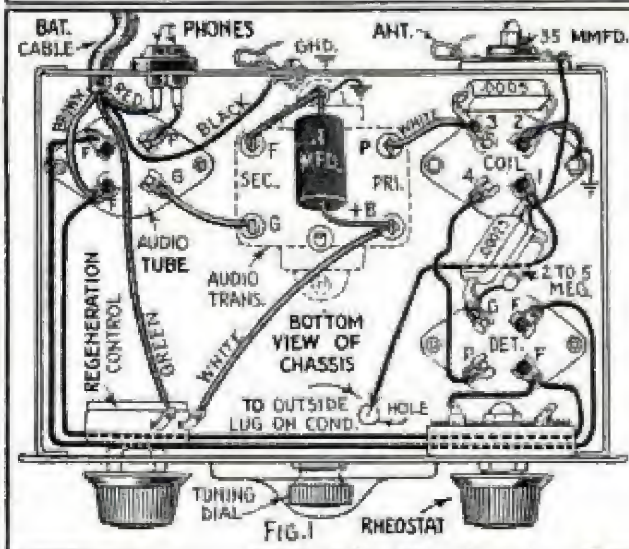


Above, Rear View Showing Tube and Coil Arrangement; Left, Completed Receiver and Batteries

side of the variable antenna-compensating condenser, Fig. 3. Care should be taken that the antenna clip does not ground against the adjacent mounting screw.

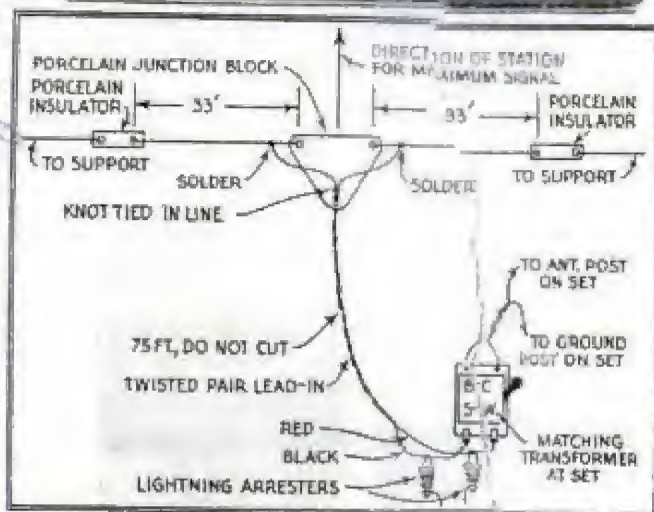
Before mounting the 100-nmf. tuning

(Continued to page 114A)



Harrison Radio Co
12 W Broad. New York

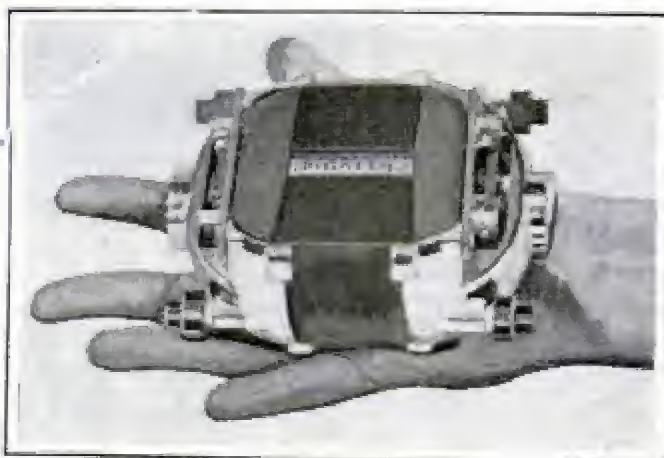
Balanced Doublet All-Wave Antenna



Above, Kit of Parts; Suggested Installation Below

Anyone can erect this balanced doublet all-wave antenna system for efficient reception and elimination of local noise. The directional properties of a doublet antenna are especially useful when a particular station is desired. Maximum signal strength is at right angles to antenna.

B-Power Dynamotor for Auto Sets



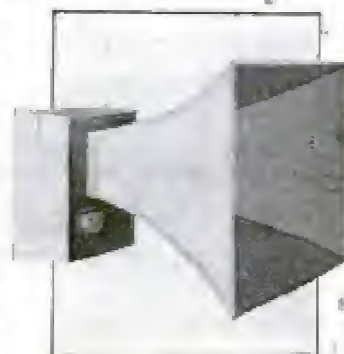
Dynamotor Produces 180 Volts; Low Battery Drain

This little dynamotor has an output of 180 volts and the drain on the auto battery is only 1.94 amperes. It comes housed

in a metal container, the unit floating on rubber to assure freedom from vibration.

Cone Speaker with Exponential Horn

Housed in a weatherproofed case, this electrodynamic unit combines the good tone qualities of a cone-type speaker with the well-known advantages of a true exponential horn for public-address work. It is suitable for indoor or outdoor operation under all conditions.



B and C-Battery Complete in One Unit

Originally designed for aircraft beacon receivers, this battery includes tapped negative-bias voltage up to 9 volts and 135



Combination B and C-Battery with Taps

volts of B battery in one block. The experimenter will find it useful for operating portable receivers, and 5-meter transceivers, as it occupies much less space than that required for ordinary batteries.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; further information and material lists are available from our Radio Department, without charge, upon receipt of postage.

Pioneer Gen. E-Motor Corp
4584 Lehigh Ave. Phila. 20, Pa.



AMATEUR MECHANICS

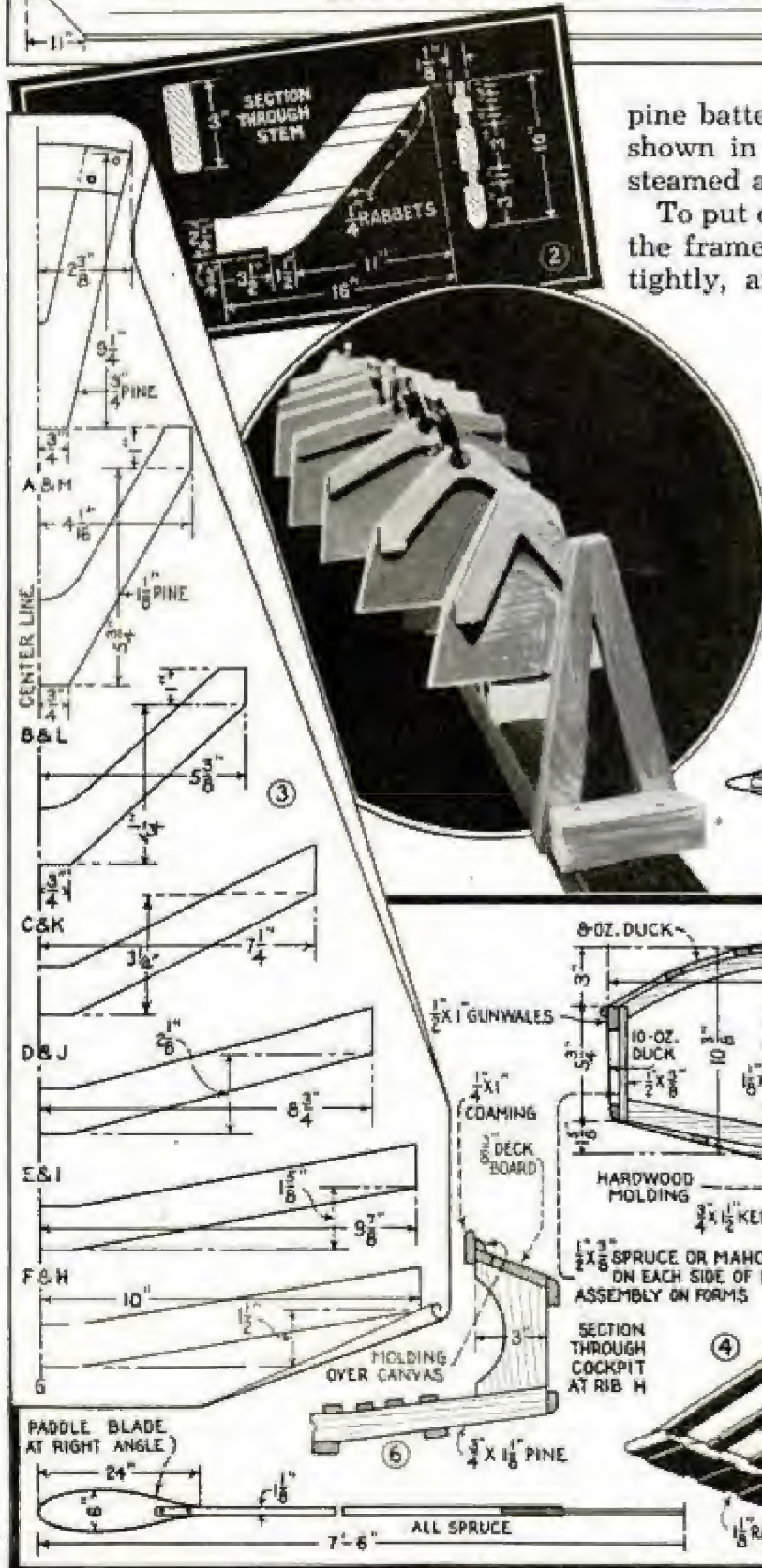
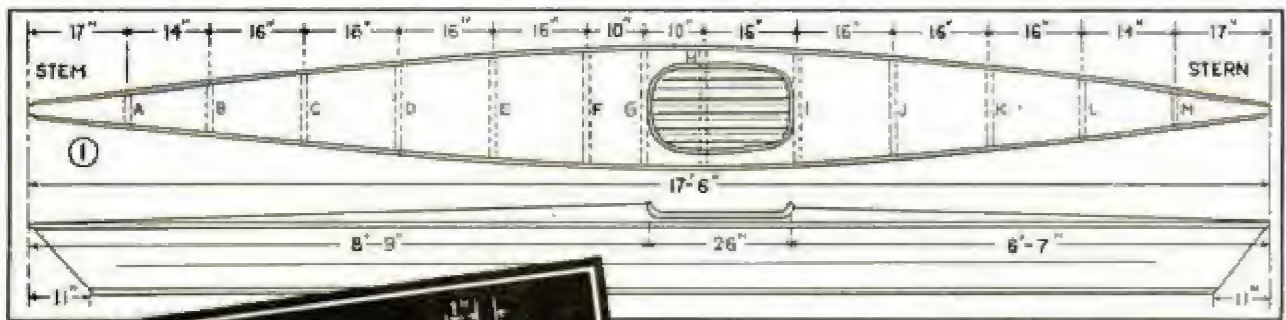
SPEEDY KAYAK *has light but sturdy frame*



BUILT by students in the Union High School at Newport Harbor, Calif., this graceful kayak has been awarded first prizes in competition. In building the boat, first make the stem and stern pieces, A and M, Fig. 3, from $\frac{3}{4}$ -in. white pine. These are rabbeted for the gunwales and strakes. Band-saw the ribs from $1\frac{1}{8}$ -in. white pine and fasten them along the keelson, assembling the frame over a simple form as shown in the photo under Fig. 2. General dimensions and locations of frames are given in Fig. 1. Use $1\frac{1}{2}$ -in. brass screws.

Follow with construction as shown in Fig. 4. The uprights are attached to strips between gunwale and chine strake, instead of directly to the ribs. Fig. 5 shows location of strakes and deck strips. These members, as well as the keelson and gunwales, should have the edges rounded so that they will not chafe the canvas covering. A sectional view of the cockpit at rib H is shown in Fig. 6. Aside from a light coaming, the cockpit is decked with $\frac{3}{8}$ -in. pine and a piece of the same stock is used for an upright. A false bottom is made of

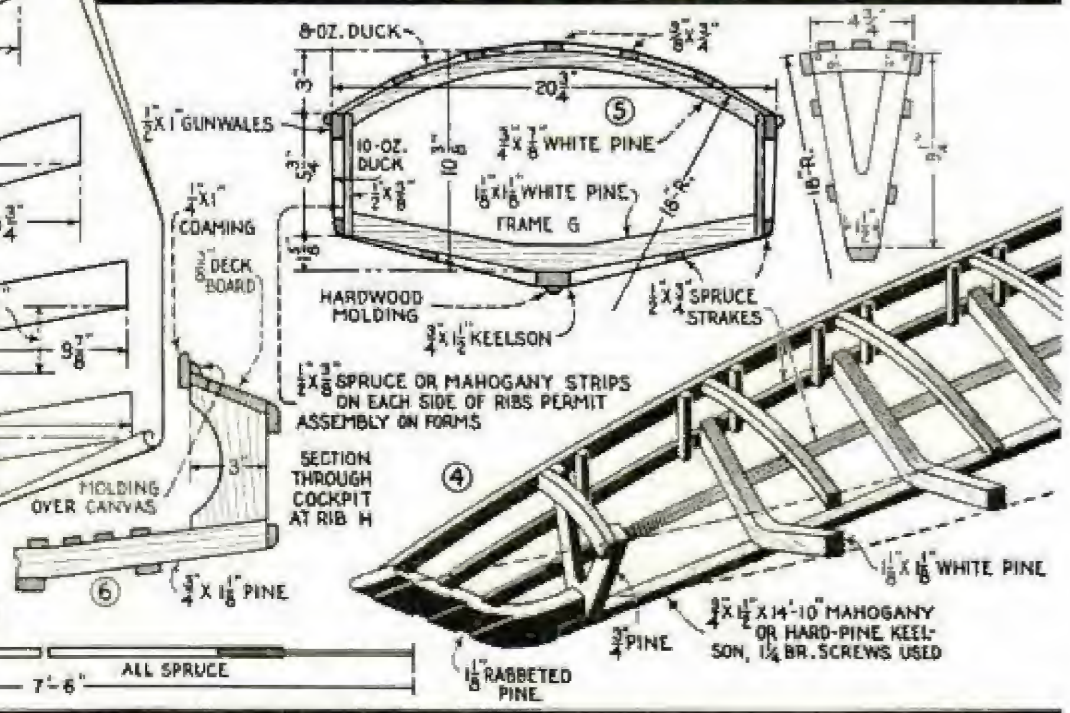
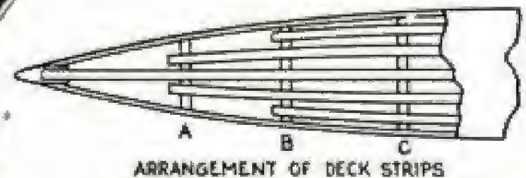
2 blueprints - 50 cents. 747



pine battens. A neat coaming is made as shown in Fig. 7, the curved pieces being steamed and bent around a wooden form.

To put on the 10-oz. bottom canvas, turn the frame upside down, stretch the fabric tightly, and tack it along the gunwales.

The ends are lapped over the stem and stern as in Fig. 8, marine glue first having been applied liberally under the seam. For the deck covering, use 8-oz. canvas. This is also tacked over the gunwales. Use only copper or galvanized tacks, as iron tacks rust quickly and rot the canvas. The latter is tacked around the edges of



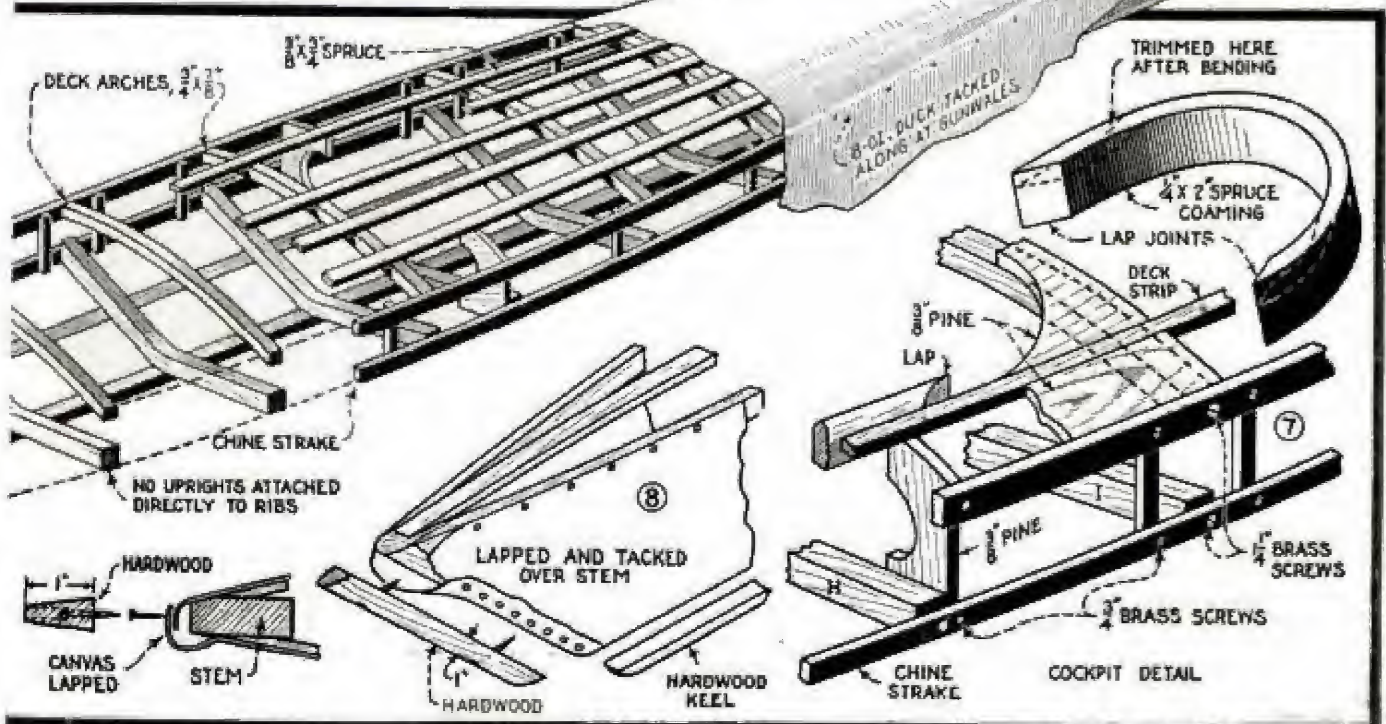


the cockpit, the waste cut off, and the coaming completed. A light molding is installed around the coaming over the tacks, and an oak or mahogany molding around the gunwales.

For a drum-tight waterproof job on the canvas, one application of airplane wing dope is applied. For paint, over this, use white lead and zinc paste, with enough oil to brush it on. If several coats are applied and allowed to dry, then sandpapered, a very smooth finish will result. Then apply the final color coats and finish the molding and coaming with a mahogany oil stain and spar varnish. The completed kayak weighs about 40 pounds.



10-OZ. DUCK TACKED ALONG GUNWALES



*Nicholas Seagley
Airplane Co. Marshall, Mo.*



Rubber Cover on Minnow Pail Shades the Bait and Permits the Hand to Be Inserted Readily

Improved Cover for Live-Bait Pail

Live bait is shaded from the sun and is readily available to the fisherman in this minnow pail, by using a slit rubber disk as a covering. Several parallel slits permit entrance of the hand and circulation of air. The disk is cut larger than the mouth of the pail so that a tin lid, with the center cut out, can be slipped over the rim to hold the rubber in place.

Soil in Small Flower Beds Prepared with Potato Masher

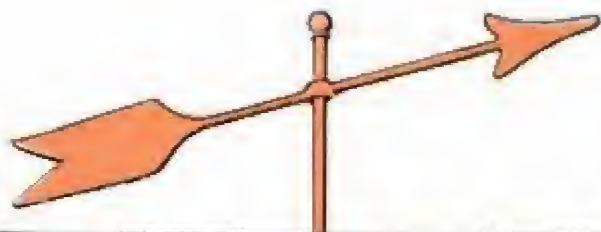
The home gardener will find a wire potato masher a handy tool for mixing small amounts of commercial fertilizer when preparing small flower beds. The soil can be pulverized readily and the fertilizer mixed with it at the same time. When using commercial fertilizers, it is advisable to follow the manufacturer's directions carefully, as too large a quantity is more harmful than too small an amount. —F. W. Bentley, Missouri Valley, Ia.



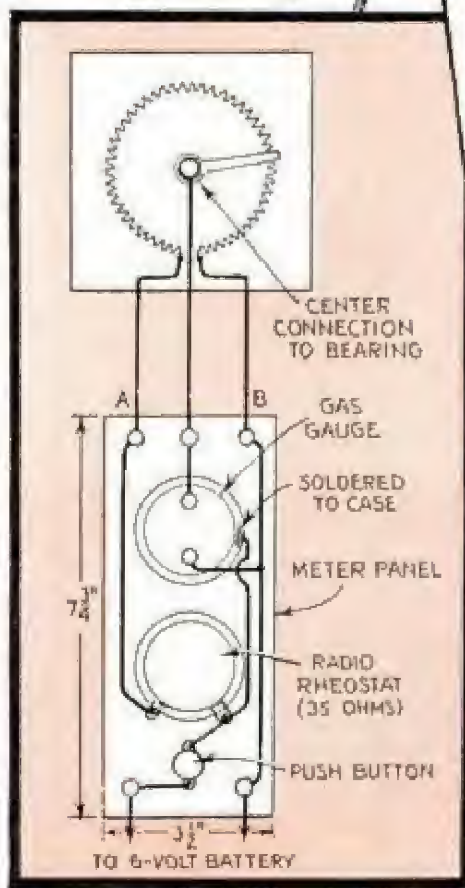
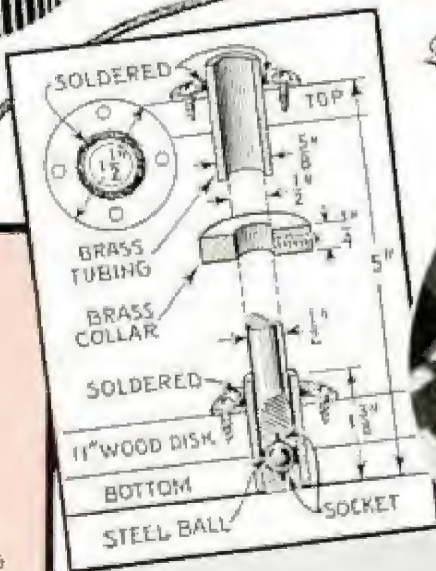
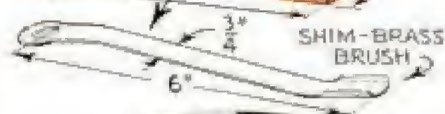
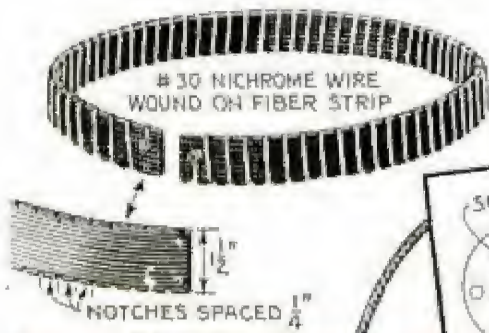
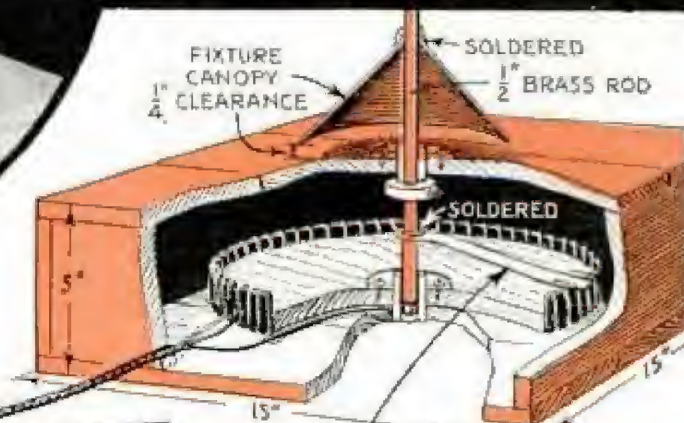
❑ A strip of tin held against a wall will protect the paper when washing woodwork.

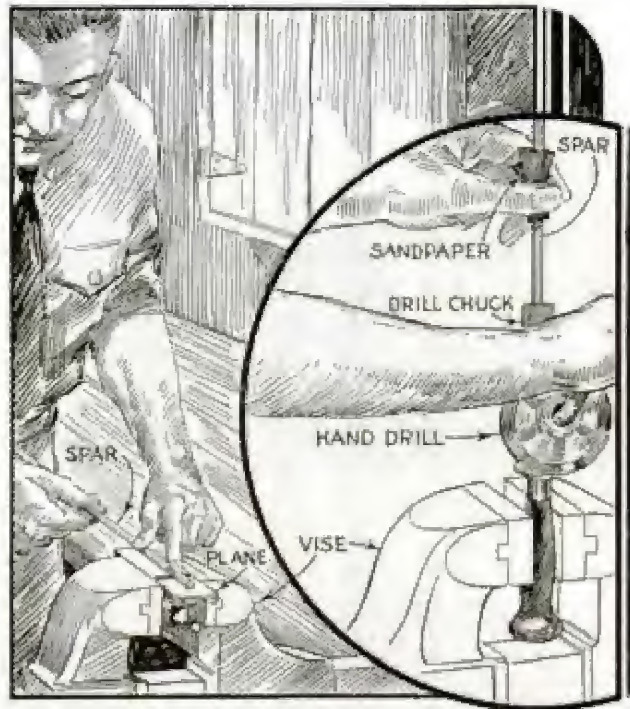
Electric Weather Vane

The weather vane shown in the illustration is connected to a battery and a discarded gasoline gauge of the electric type. The vane is mounted on a shaft which moves a sliding contact over a coil of No. 30 Nichrome wire as shown. An 11-in. disk is cut from a piece of 1-in. hardwood to the diameter shown. Around its edge is fastened a thin strip of bakelite or fiber 1½ in. wide and long enough to go around the block with the ends just meeting. This strip is notched every ¼ in. on one edge so that the bare wire may be spaced evenly. A thin sheet-brass wiper is soldered to the shaft so that its end wipes gently over the edges of the Nichrome wire. The end of the shaft rests on a ball bearing to make the vane highly sensitive to even a low wind. When the vane and gauge panel have been completed they should be connected as shown in the wiring diagram. To adjust the rheostat in the gauge panel, turn the sliding contact in the vane assembly so that it makes contact with the center of the Nichrome wire coil. This should be at a position exactly opposite the point where the ends of the fiber come together. With the vane in this position adjust the rheostat so that the meter pointer is in exactly the center of the scale or at the place where the gauge reads half full. If connections are correct the rheostat will never have to be changed. It is simply used to adjust for the electrical resistance of the Nichrome wire and the connecting wires. With this adjustment, turn the vane arm so that it is halfway between the last position and the junction of the fiber strips, or at right angles to the former position. The meter should now read either ¼ or ¾. The last test is made by turning the vane arm so that it contacts a point in the Nichrome wire coil opposite the last point and noting if the meter reads correctly. If there is any difficulty in getting the meter to read correctly the first thing to try is interchanging the connections of the wires marked "A" and "B." If the first connection fails to give good readings this alternate connection usually works; however, if an off-make gauge is used, which has its internal connections made differently than the one used in the tests on this outfit, it may be necessary to experiment by interchanging the connections on the meter.



An Electric WEATHER VANE





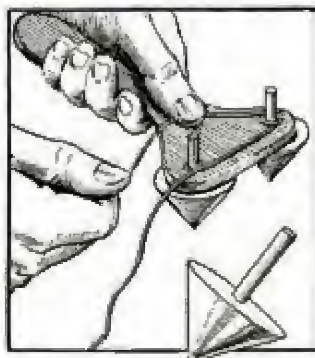
With the Use of a Plane and Hand Drill, You Can Make Spars for Ship Models Quickly

Quick Method of Making Spars for Model Ships

The usual tedious job of making small spars for ship models is done with little effort by using a small plane and a hand drill. The plane is inverted and clamped in a vise, after which the spars are worked down to approximate diameter by pushing them over the cutting edge of the plane iron. They can be sanded then by chucking them in the drill and revolving them in a folded piece of sandpaper as shown.

Twin Spinner Races Tops

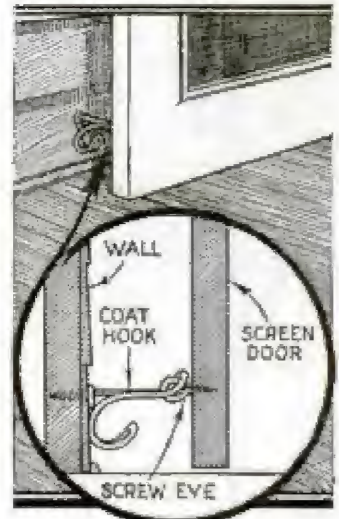
Every boy who enjoys spinning tops will get just double the fun out of this twin spinner by racing one top against the other. They are whittled from a spool in the usual way, the shanks being trued up to fit loosely in holes drilled in the paddle as shown. This is cut from thin plywood or the lid of a cigar box. To spin the tops, use a soft, flexible string and give it one turn around the shank of each top. Then, holding the string gently against the face of the



paddle, give the string a quick pull with your right hand. When the string pulls free, the tops will drop to the floor and the race is on.

Coat Hook Serves as Door Stop

To hold a screen door open, this simple stop will be found practical. A wire coat hook is screwed into the side of the house in line with the outer edge of the open screen door. A screw eye is then driven into the frame of the screen, to snap under the extending loop of the hook when pushed against it. The spring tension of the hook tends to hold the door, but a slight jerk will dislodge it.—G. E. Hendrickson, Argyle, Wis.



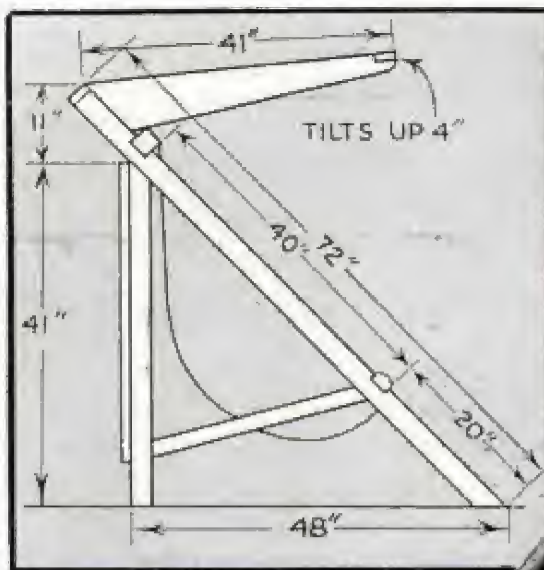
Appearance of Putty Jobs Improved with Wood Chisel



After a pane of glass has been put-tied into a window, the appearance of the finished job can be improved by going over the soft putty with the edge of a concave wood chisel as shown. This is drawn over the putty much in the same manner as a knife to give the work a concave or hollow appearance. The size of chisel used determines the depth of the depression made in the putty, a wide chisel forming a shallow impression, while a narrow tool makes a deeper one.—Kenneth Murray, Sturgis, Mich.

❏ Faded tiffany or mottled finish on walls can be brightened by a solution consisting of turpentine, 2 parts, and boiled linseed oil, 1 part, applied with a soft cloth.

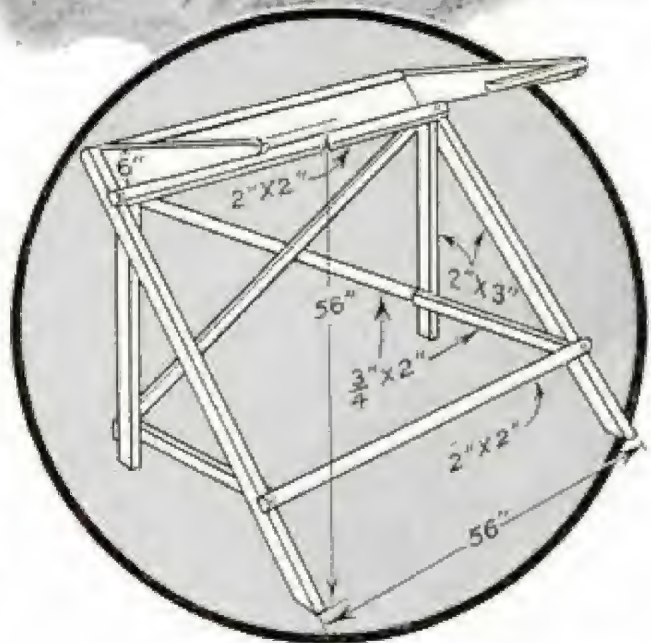
Sturdy Lawn Seat Gives Comfort and Shade



Here is a very comfortable lawn seat that will not tip over or be damaged by romping children. It holds three adults, and with the broad canopy makes a cool retreat on sunny afternoons. It is light enough to be moved about easily. The diagonal members of the frame are 2 by 3-in. stock, with 2 by 2-in. cross members, and $\frac{3}{4}$ by 2-in. braces. The cross members are mortised into the diagonals. Two tapered side members support the awning frame. Round all the corners and edges, that is, the exposed ones, with a plane, and sandpaper so there will be no danger of splinters, and stain all the wood green. A coat of spar varnish over this will protect the wood against the effects of constant exposure to the weather. Select a good quality of striped awning cloth, and tack it to the cross members with galvanized or copper tacks, as ordinary steel ones will soon rust and stain the cloth.

Chair Bottoms Woven with Strips of Inner Tube

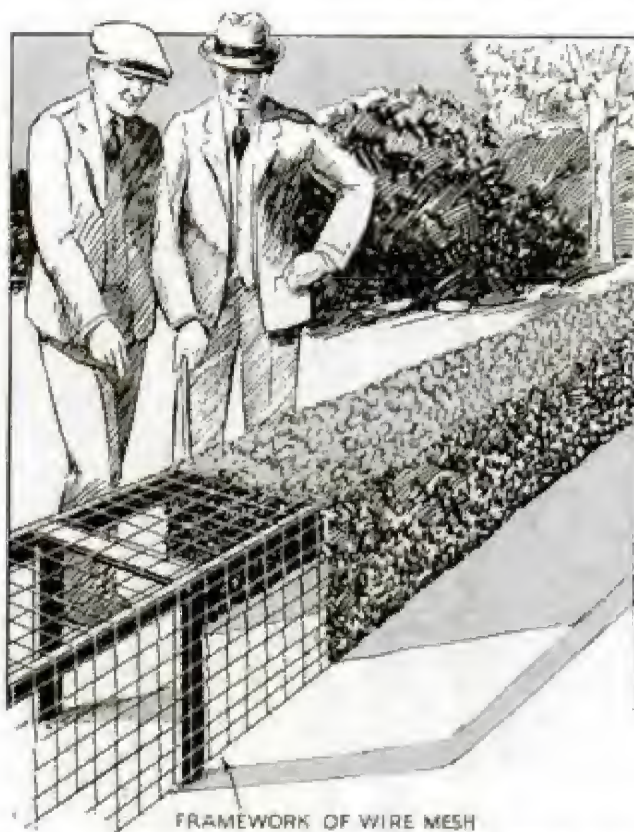
Inner-tube strips not only lend themselves readily to weaving comfortable chair seats, but many beautiful designs may be woven by using rubber of different colors. Cut the tube into one continuous strip, or use short strips, the ends of which are beveled and cemented together. A basket weave is used in making the seat, and is done easily. Start at one side and wind the strips over the seat, working toward the opposite side. When this is done,



wind the strips over the seat in the opposite direction, weaving them under first one cross strip and over the adjoining one. Care must be taken to get the strips fairly taut, but not too tight, as their combined tension may tend to warp the sides of the seat. The rubber may be



used also in weaving backs in chairs, or for making comfortable cots.



Vines Growing over Wire-Covered Framework Provide Temporary Substitute for Box Hedge

Quick-Growing Vines Serve as Substitute for Hedge

Growing a hedge in the usual manner is not only expensive, but takes several years for it to grow to the desired size. As a practical substitute, which will grow rapidly and require little or no trimming, one may construct a framework of wire mesh as shown, and plant climbing vines along the sides. These vines will train themselves over the wire to produce a beautiful box hedge in a very short time.

Rubber Silences Squeak When Filing Saws



The annoying, shrill squeak that ordinarily accompanies the filing of a saw may be moderated considerably if a strip of inner tube is inserted between the vise jaws and the saw blade. The vise may be tightened to hold the saw securely, but the rubber will absorb much of the objectionable vibration.

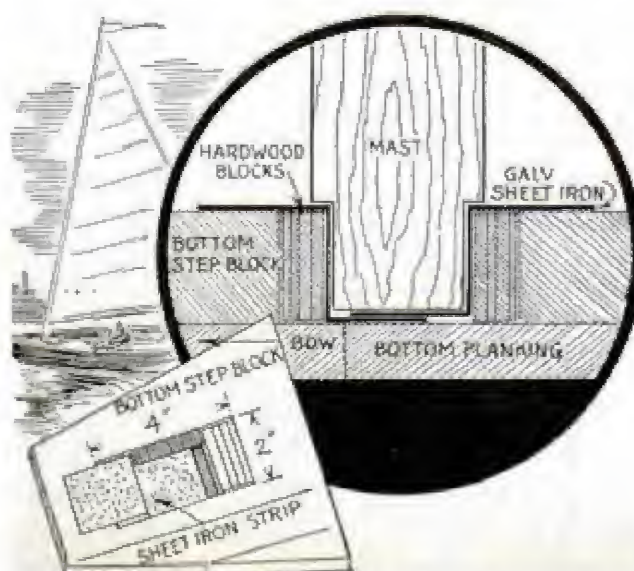
Steel Pin Keeps Chain on Padlock

The inconvenience of having a chain drop off a padlock shackle when it is unfastened may be avoided by using a tapered steel pin as shown. The shackle is drilled in the center to take the pin, after which the chain is slipped in place and the pin driven tightly into the hole. The pin should be small in order not to unnecessarily weaken the shackle.—C. Tyler, Chicago.



Adjustable Mast Step for Small Sloops and Cat Boats

Here is a simple idea that will help owners of small sloops and cat boats solve the problem of making a mast step that will permit adjusting the fore and aft angle of the mast, yet prevent it from loosening at a crucial moment. Small hardwood blocks are used as in the usual method, but they are prevented from working upward by strips of heavy sheet iron, which are bent under the bottom of the mast and up over the top sides of the blocks. To

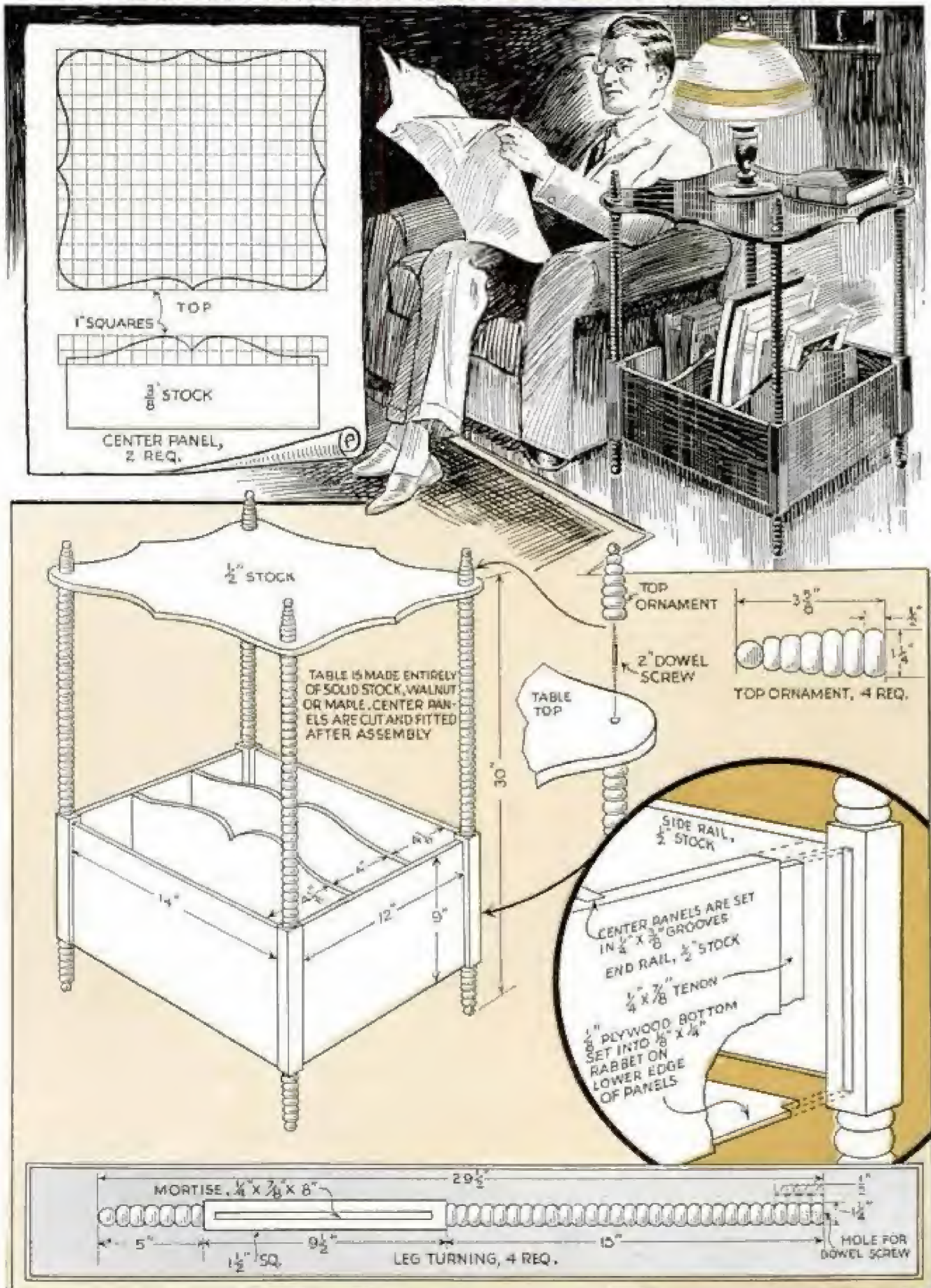


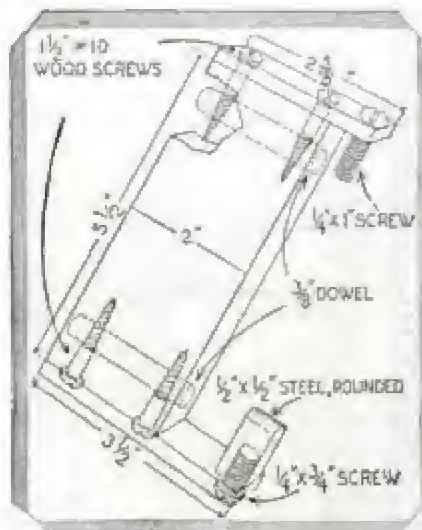
Adjusting Blocks on Mast Step of Small Boat Held in Place by Sheet-Iron Strips

change the angle of the mast, simply lift it from the step, remove the sheet-iron strips, and change the blocks as required. Then replace the strips and insert the mast.—Paul H. Van Ness, Yonkers, N. Y.

Build this CANTERBURY TABLE

TABLE AND MAGAZINE RACK COMBINED IN ONE UNIT





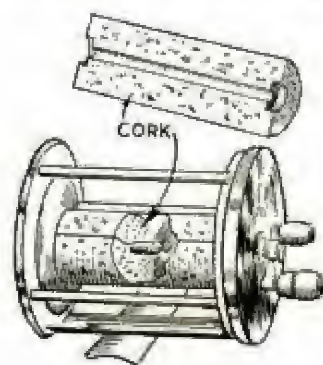
Guide Simplifies Cutting of Grooves and Rabbets in Irregular Work on Home-Workshop Mortiser

Routing of Irregular Surfaces Made Easy with Guide on Mortiser

Owners of home workshops will find this work guide a great aid when grooving or rabbeting irregular surfaces. It is merely a small steel block rounded at one end and clamped over the inside edge of the mortiser table directly under the routing bit by means of a clamp, which consists of a hardwood block with flat iron strips screwed to the ends. The strips are drilled and tapped for machine screws, one of which screws into a tapped hole in the steel block and the other serves as a clamp screw. In use, the irregular edge of the work is held firmly against the rounded end of the steel block, which guides the work as it is pushed into the routing bit.—John M. Chittenden, Atlantic City, N. J.

Cork Arbor on Casting Reels

For filling the spoon of a casting reel to accommodate the regulation 50-yd. lengths of casting line, one fisherman claims there is nothing quite as good as a bottle cork of a size to fit snugly between the spool flanges. The cork is split in half lengthwise, after which the halves are grooved through the center to fit over the spool shaft. To attach the arbor the cork pieces



are given a heavy coat of waterproof glue and allowed to set about 15 min., after which they are given a second coat, at the same time coating the spool shaft and flanges. The cork is then put in place where it is held with several turns of thread until the glue dries.

Kitchen Work Table Fastened to Wall

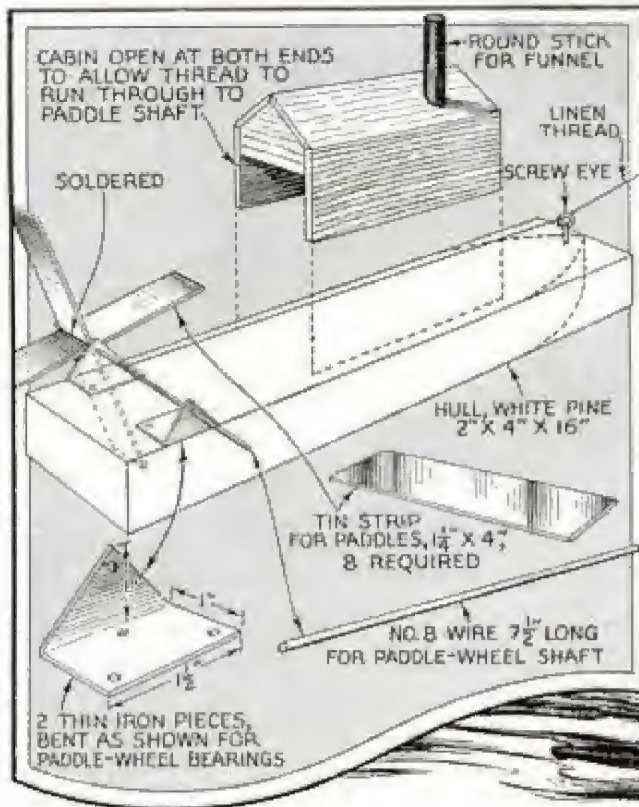
The tendency of a kitchen table, fitted with casters, to move about when a food chopper or other machine is attached to it may be eliminated by fastening it to the wall as shown. Screw hooks are driven into the rear legs of the table about 6 in. above the floor, and screw eyes are driven into the baseboard at a corresponding height. By lifting the table slightly, the hooks can be slipped into the eyes, and can be disengaged readily.



Table Fitted with Casters Is Fastened to Baseboard to Prevent Creeping When Using Food Chopper or Other Machines

¶To encourage your canary to take a bath, sprinkle a few seeds on the water.

Model Side Wheeler Is Powered by Stream



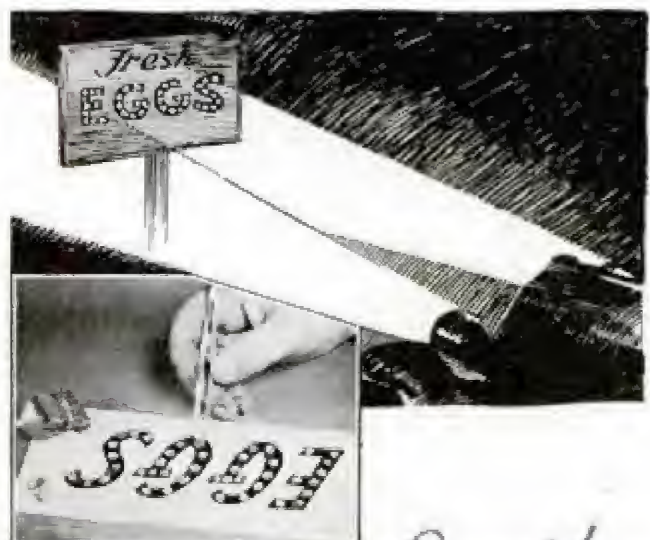
A long thread winding on the paddle-wheel shaft of this model steamboat pulls it upstream as the current turns the wheels. One end of the thread is anchored well ahead of the boat and is invisible from a short distance. Thus, the boat has the appearance of being driven against the current under its own power. The thread passes through a screw eye at the bow, through the cabin, which is open at both ends, back to the paddle shaft.

When the boat reaches the end of the thread, remove the latter from the anchor and the screw eye, and turn the boat around. Tie the thread to the anchor, and you are ready for a trip downstream.—Dale R. Van Horn, Lincoln, Nebr.

Imitation Jewels in Signs to Reflect Light of Passing Cars

Roadside signs can be made to shine brilliantly at night in headlights of passing autos by using inexpensive rhinestones or paste diamonds taken from old jewelry of the dime-store variety. Paint the sign in the usual manner, with black letters over a light background. To hold the stones, make holes about $\frac{1}{2}$ in. apart in the letters to keep them flush with the surface, and fasten them in place with glue.

■ A basement floor can be given the effect of tile by marking it off in small squares which are then painted alternately with two colors.



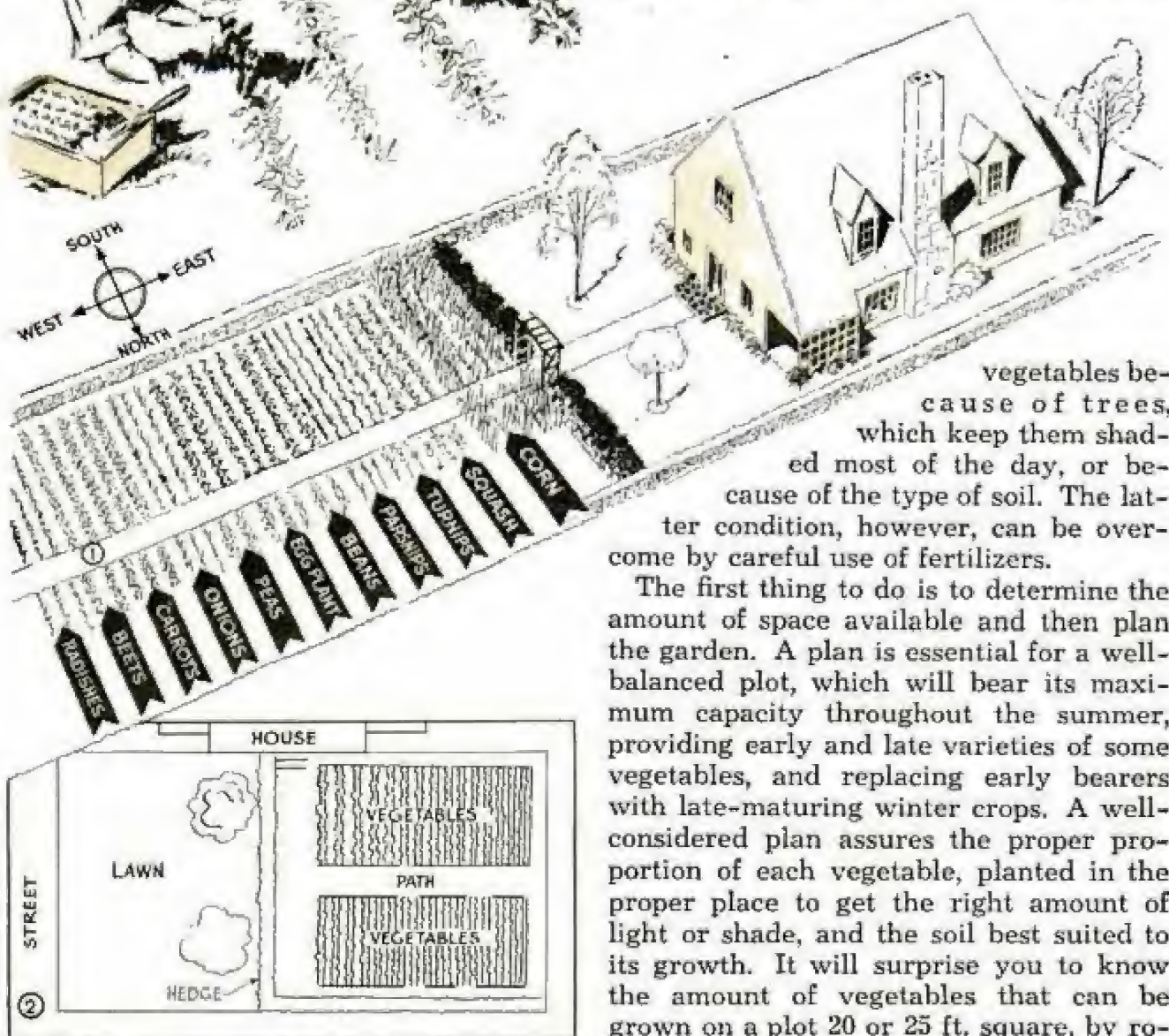
J. J. Wyle & Brothers,
1500 3rd St. N.W., Wash. D.C.



The Secrets of BACKYARD

By J. R. WARD

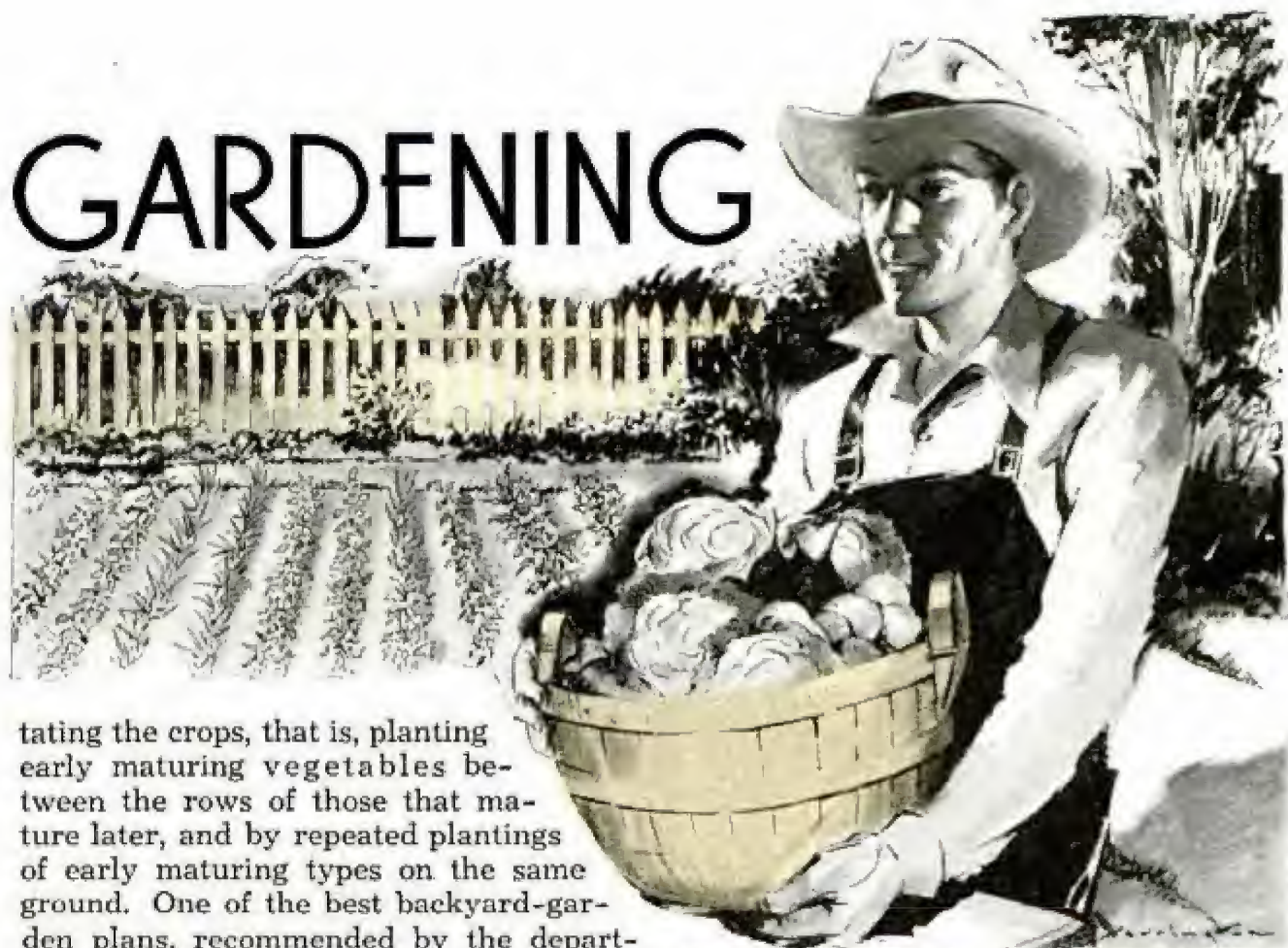
THERE is probably no other spare-time work that affords as much pleasure and profit for the city or small-town resident as a backyard vegetable garden. Besides providing recreation for the man who spends most of his day indoors, a small garden will supply you with fresh vegetables, the crispness of which cannot be equaled by those purchased in a store, especially vegetables of the type that deteriorate rapidly, such as radishes, lettuce, corn, peas and green beans. All backyards, of course, are not suitable for growing



vegetables because of trees, which keep them shaded most of the day, or because of the type of soil. The latter condition, however, can be overcome by careful use of fertilizers.

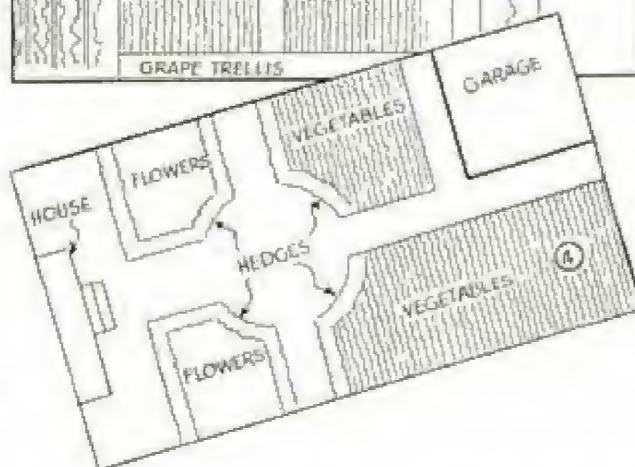
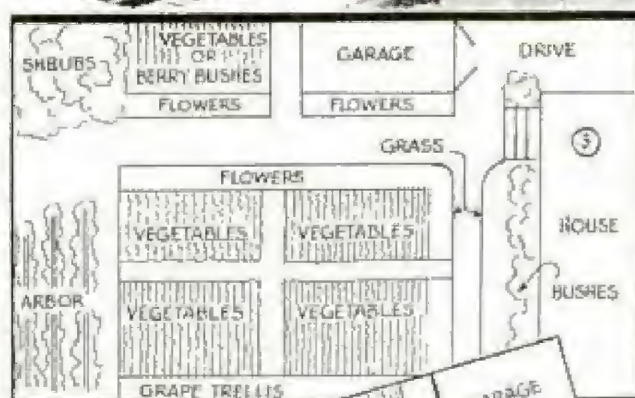
The first thing to do is to determine the amount of space available and then plan the garden. A plan is essential for a well-balanced plot, which will bear its maximum capacity throughout the summer, providing early and late varieties of some vegetables, and replacing early bearers with late-maturing winter crops. A well-considered plan assures the proper proportion of each vegetable, planted in the proper place to get the right amount of light or shade, and the soil best suited to its growth. It will surprise you to know the amount of vegetables that can be grown on a plot 20 or 25 ft. square, by ro-

GARDENING



tating the crops, that is, planting early maturing vegetables between the rows of those that mature later, and by repeated plantings of early maturing types on the same ground. One of the best backyard-garden plans, recommended by the department of agriculture, was applied in a 25 by 70-ft. lot, and yet in that fairly small space were included such permanent plants as grapes, strawberries, currants, beds of asparagus and rhubarb, besides early and late peas and onions, sweet corn, cabbage, beans, beets, lettuce, parsnips, radishes, potatoes, kale and spinach, as well as peppers and eggplant. In the main, however, the owner of a very small plot should confine his efforts to vegetables that deteriorate rapidly when picked and marketed through stores. In Figs. 1, 2, 3, and 4 are shown plans that may be of help in laying out your garden, at the same time, providing space for a lawn and flower beds.

Having planned your beds, the next step is to get tools and prepare the ground. These usually include a hoe, rake, trowel, spading fork, and possibly a couple of weeding tools. In most cases, it is advisable to spade up the ground in the fall, especially if the land is in sod, so that the grass and roots will rot. Heavy clay soils should be turned up loosely and allowed to freeze and thaw during the winter months. In all cases, plenty of manure should be turned under. Most commercial gardeners not only follow the practice of



spading under large quantities of manure, but they stack it up to rot, and then apply the rotted material as a top dressing when preparing the land for planting. If manure is not available, then commercial fertilizers should be used, following the instruc-



tions given for applying them. Clay soils are often benefited by mixing sifted coal or wood ashes with them. Ashes, unless they are made by burning hardwoods, have no value as a fertilizer, but they do tend to keep the soil loose so that the plant roots get plenty of air. Not more than 50 lbs. of dry, unleached hardwood ashes should be applied in a garden 30 by 60 ft. in size. Proper fertilization and preparation of the soil are necessary, as much of the success in gardening depends on this operation.

One of the most important items in gardening is the selection of pure, graded seeds that have been marketed by a responsible firm, as there is nothing quite so discouraging as to spend time and labor in

planting a garden and then have it fail because only about half of the seeds germinated. What to plant depends mostly on the size of your garden plot, and the vegetables preferred by you and your family. Planting time is determined by the season in your particular locality, most seeds being planted as soon as the ground is warm and danger of frost is past. All packages of seeds have instructions printed on them concerning the depth to plant and the kind of soil best suited to their growth. However, it is not necessary to wait for warm, spring days to start many of your vegetables as they can be started in a hotbed, cold frame, or a seed box, and then transplanted as soon

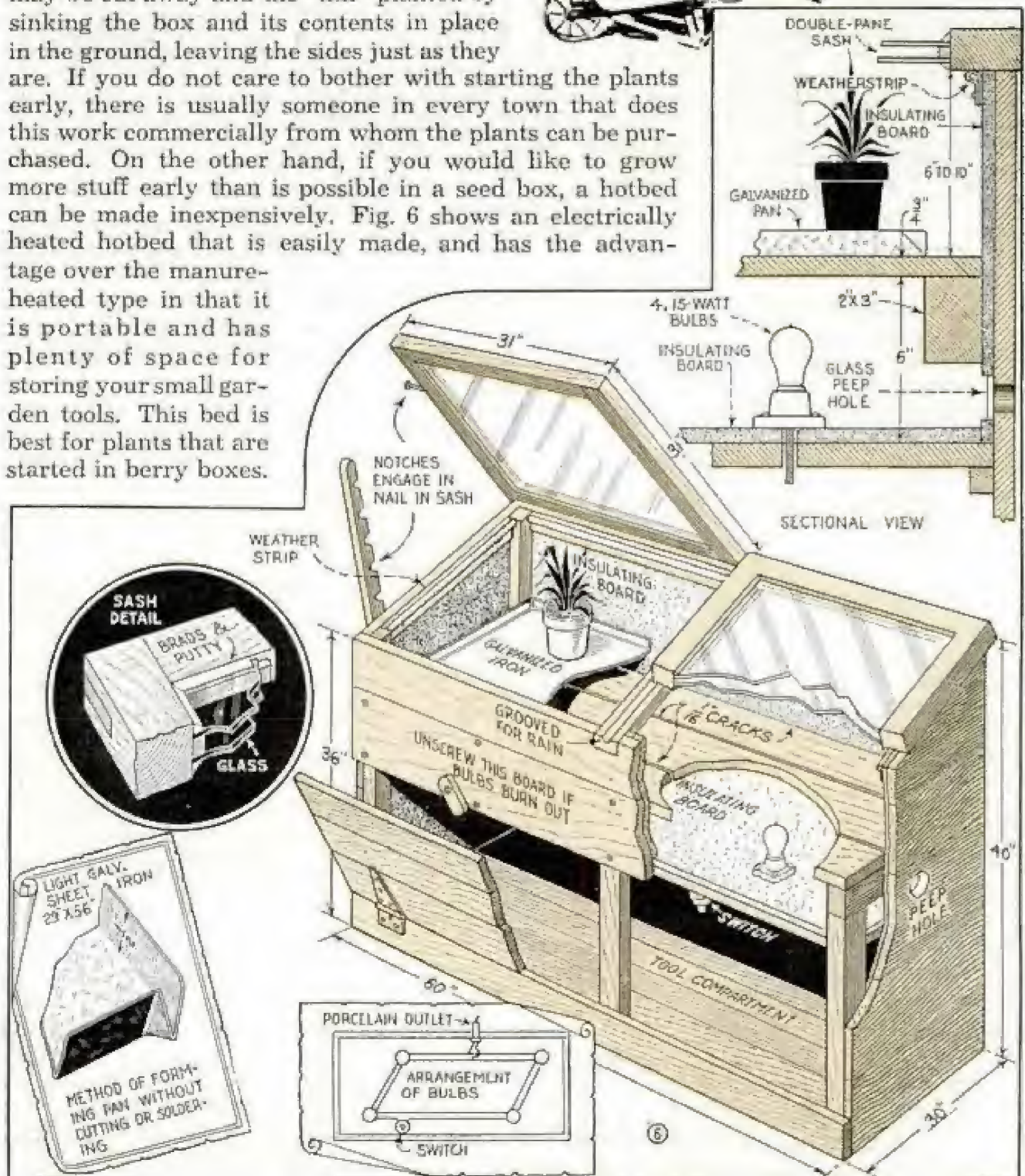
as the weather permits. The latter, shown in Fig. 5, is probably the most practical for the small-plot gardener, and is kept in front of a window in the house or basement. Any sort of wooden box filled with good soil answers the purpose, one 4 by 12 by 24 in. in size being about the right size. To prepare the box, place a layer of about 1 in. of gravel or cinders in the bottom and then fill nearly to

the top with garden soil, enriched with decayed leaves or other fertilizer. Press the soil down firmly with a small board, and scratch rows $\frac{1}{4}$ to $\frac{1}{2}$ in. apart crosswise of the box. Keep the dirt well watered. If the surface of the box is covered with a piece of glass, it will cause the soil to hold the moisture and hasten germination of the seeds. When the weather becomes mild, the box should be set outside part of each day so that the plants may "harden off" in preparation for removal to the garden. A good watering should be given the plants just before they are taken out of the box so that a ball of earth will stick to the roots of each one. In this way,



early crops of tomatoes, cabbage, Brussels sprouts, cauliflower, peppers, eggplant and lettuce can be had with little outlay for equipment. Seeds so planted germinate and are ready for transplanting by the

time it is safe to sow the same kind of seed in open ground. Transplanting, if done properly, instead of injuring such plants, seems to help them develop a strong root system. Another inexpensive method of starting your vegetables early is to plant them in wooden berry boxes, cardboard boxes or any other available receptacles. Hills of beans, tomatoes and many other vegetables may be started in the house in this manner. When the time comes for transplanting, the bottoms of the boxes may be cut away and the "hill" planted by sinking the box and its contents in place in the ground, leaving the sides just as they are. If you do not care to bother with starting the plants early, there is usually someone in every town that does this work commercially from whom the plants can be purchased. On the other hand, if you would like to grow more stuff early than is possible in a seed box, a hotbed can be made inexpensively. Fig. 6 shows an electrically heated hotbed that is easily made, and has the advantage over the manure-heated type in that it is portable and has plenty of space for storing your small garden tools. This bed is best for plants that are started in berry boxes.



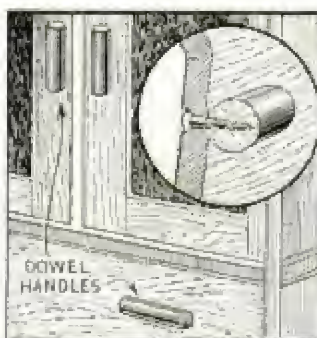
Movie Reel Serves as Filter Turret on Box Camera



Removable Filter Turret on Box Camera Is Convenient, and Permits Rapid Selection of Filters

Discarded reels on which home-movie film is wound are converted easily into filter turrets for box cameras. To do this, remove the reel core and glue squares of red and yellow celluloid over two of the round holes in the side of the reel, and a couple thicknesses of Cellophane over the third one, leaving the V-shaped hole open for regular photographing. Then put the reel together and attach it to the bracket shown, with a stove bolt, using a washer on each side of the reel. The bracket is fastened to the bottom of the camera with tripod screws so that the reel is held in front of the lens.

Neat Modernistic Door Handles for Furniture



Short lengths of 1-in. dowel rod make ideal door handles and drawer pulls. When lacquered in contrasting colors, they add a bright note of modern simplicity to a

piece of furniture. Wood screws are used for attaching the dowels, and are driven into the handle from the inside surface of the door as shown.—J. Modroch, Chicago.

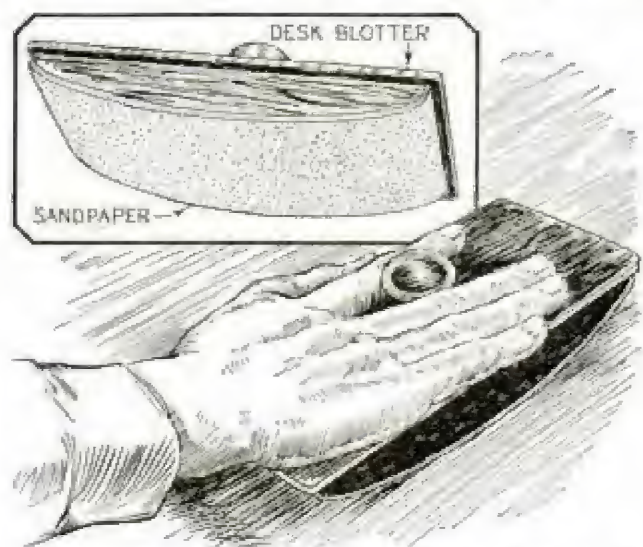
Chemists' Ring Stand Made from Stove Lid

Amateur chemists need pay no more than the price of a few stove lids and several feet of iron rod for ring stands in their laboratories. As shown, a stand can be made by welding a 2-ft. length of $\frac{3}{8}$ -in. iron rod into the lifting well of a stove lid. On most lids, the well projects below the underside, and therefore the rod must be welded to this side.—Raymond Jones, Salt Lake City, Utah.



An Improvised Sanding Block

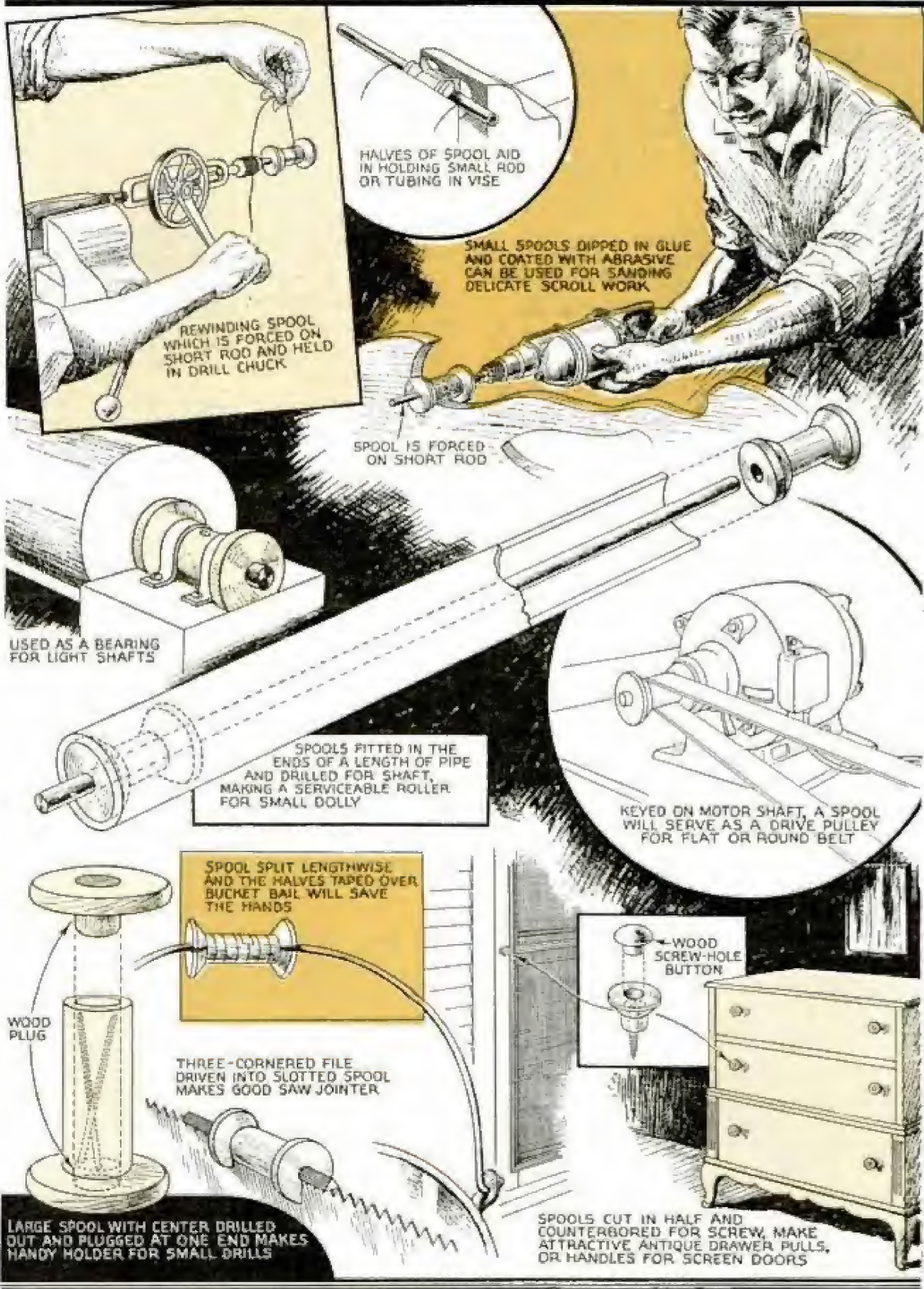
A rocker-type desk blotter is converted easily into a sanding block that is especially handy for finishing irregular surfaces. Merely substitute a strip of sandpaper for the blotting paper, but instead of using one strip, attach several pieces, which can be removed one by one, as they wear out.—Thomas B. Owens, Cleveland, Ohio.



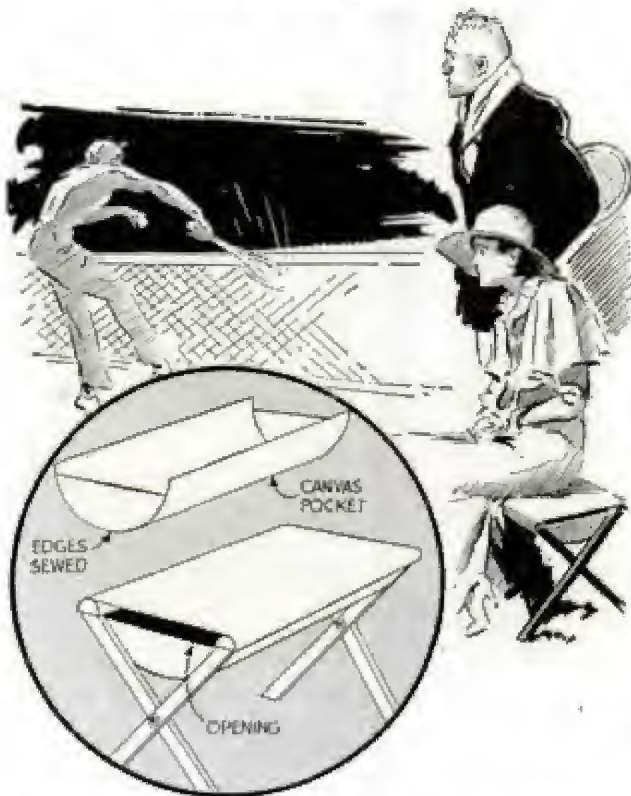
Rocker-Type Desk Blotter Provides Sanding Block for Finishing Both Smooth and Irregular Surfaces

☐ Mahogany stain can be made by adding hot melted tar, $\frac{1}{4}$ lb., to turpentine, 1 pt.

NEW USES *for* EMPTY SPOOLS



Pocket on Folding Camp Stool Provides Handy Storage Space



Pocket under Camp Stool Provides Storage Space for Purses and Extra Clothing at Sporting Events

Tacked to the underside of a folding camp stool, a canvas pocket provides a handy place in which to store small articles, such as purses and extra clothing. The pocket is especially handy when using the stool at tennis courts, or when using it as a seat from which to watch sporting events where seats are not provided.

Hack-Saw Blade Used to Scale Fish



it is bent to the shape shown. A wooden handle may be riveted to it, or the two ends of the blade can be riveted together and wrapped with friction tape to form a handle. If a suitable file is at hand, it is a

Made from an old hack-saw blade, this fish scaler will be found handy around the home or on a fishing trip. The blade is annealed by heating it to a red heat and then letting it cool slowly, after which

good idea to deepen the teeth slightly before hardening the completed scaler.—G. W. White, Severn Park, Ont., Can.

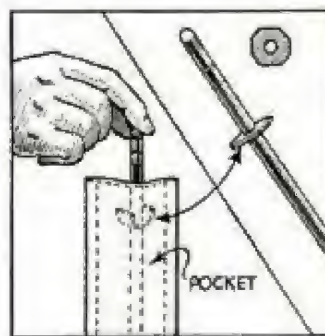
Dustpan Fitted with Long Handle Eliminates Stooping

Your dustpan can be improved by bending the handle upward and inserting a length of broomstick, which is held in place with a small wood screw. This makes stooping unnecessary to pick up piles of dirt after sweeping a floor.—George L. Gilbert, Hollywood, Calif.



Rubber Washer Prevents Loss of Pencil

To prevent a lead pencil from dropping out of your pocket when stooping, cut a square washer from a piece of inner tube and slip it over the pencil. The latter will not roll easily when laid on a sloping surface, and, when inserted into the pocket, the washer doubles back to prevent it from being removed easily.



Paper Aids in Threading Needles

By folding a piece of white card or stiff paper to make a trough, and forcing a needle through this at the fold line, one may thread the needle readily. The white paper reveals the needle eye clearly. When the latter is turned at right angles across the trough, it is a simple matter to slide the thread along the groove and through the eye.



Junior's FURNITURE *has Secret Compartments*

THIS furniture makes a boy's room distinctly his own, and, not only provides a place for many of the things a boy uses in study and play, but each piece has some secret compartment or lock to intrigue the owner and mystify his friends.

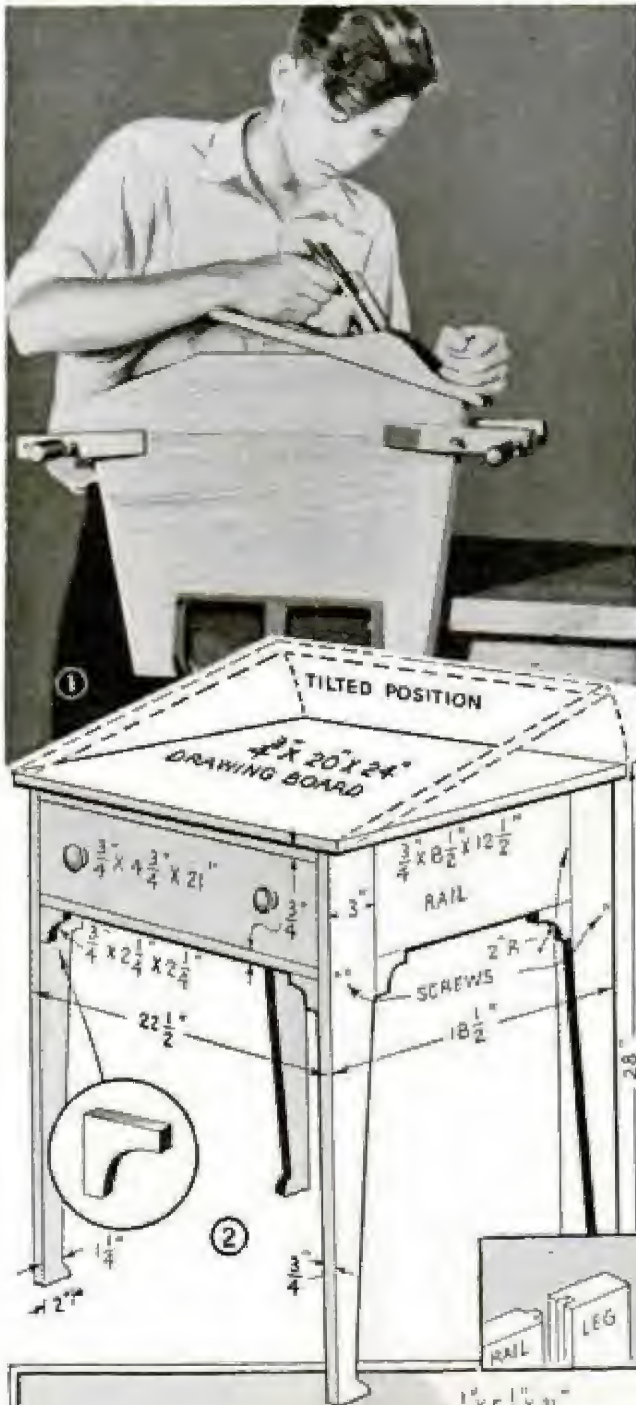
The drawing table, shown in Figs. 2 to 5 inclusive, is the easiest to construct. A regular drawing board is used for the top, and the legs are made of tongued-and-grooved pine. Cleats, screwed along the inner faces of the sides to form the drawer slides and guides, strengthen the joints so that short tenons are sufficient. After the sides have been assembled, the back and front drawer rails are screwed in place. Fig. 4 shows how the drawer is made with its false bottom and secret drawer, while Fig. 5 is a rear view of the



table indicating how the lid may be tilted for drawing, and to give access to another hidden compartment at the back. Notice where the pivot point of each hinge is located. The hinges are recessed into the upper drawer rail and top. Brackets, pivoted by a screw through one end, support the top when it is raised.

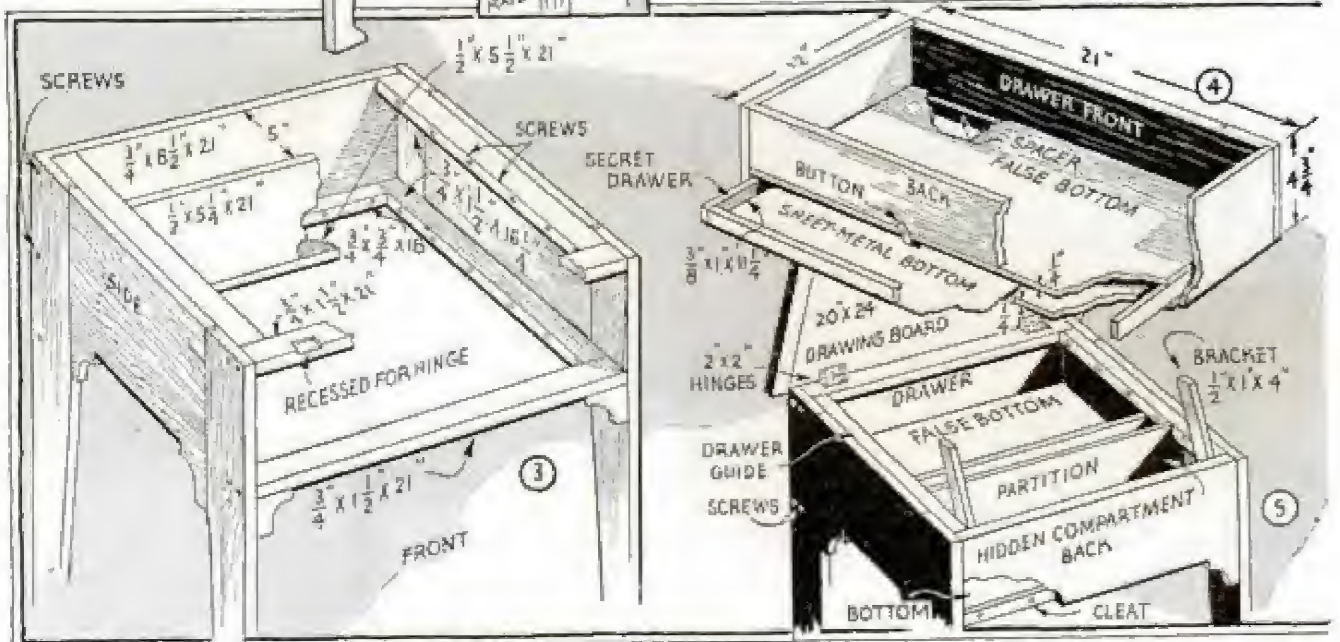
The bookcase, shown in Fig. 7, has two sliding side panels which expose hidden compartments. The construction of this case, and the location of the compartments are illustrated in Fig. 8. Tongued-and-grooved material is used for the sides of the legs to provide grooves in which the $\frac{1}{4}$ -in. fir panels slide. Note that the decorative scroll pieces between the legs are tacked to the panels only so that they move up and down with them. A metal turn-button controls the lowering of the panel. There is a compart-





ment on each side of the case. The panel door is constructed as shown in Fig. 6. Pieces of tongued-and-grooved stock are cut to width and a tenon is formed on two of the pieces as shown. If the panel is cut to a snug fit and glued in place, it will strengthen the door greatly.

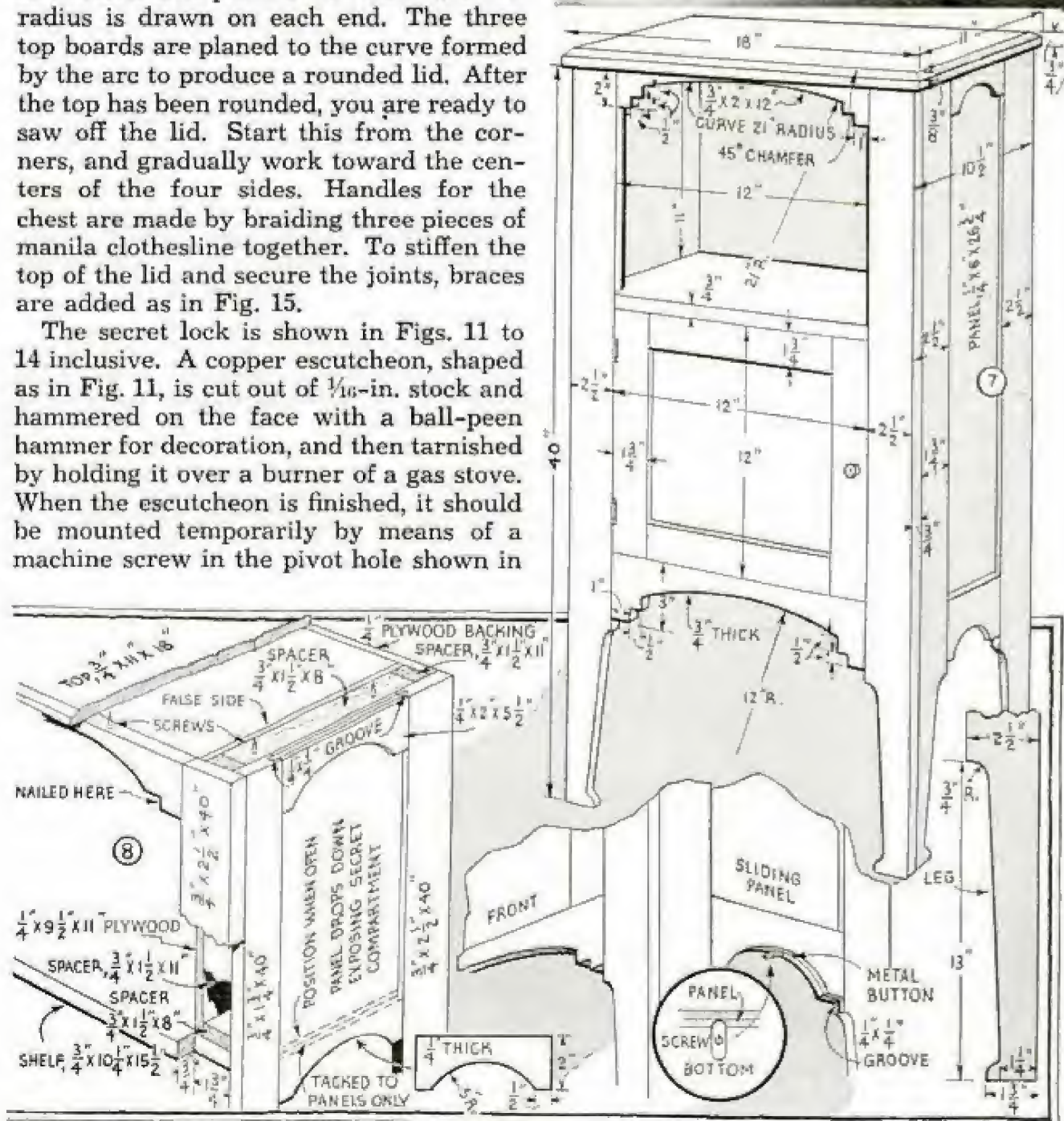
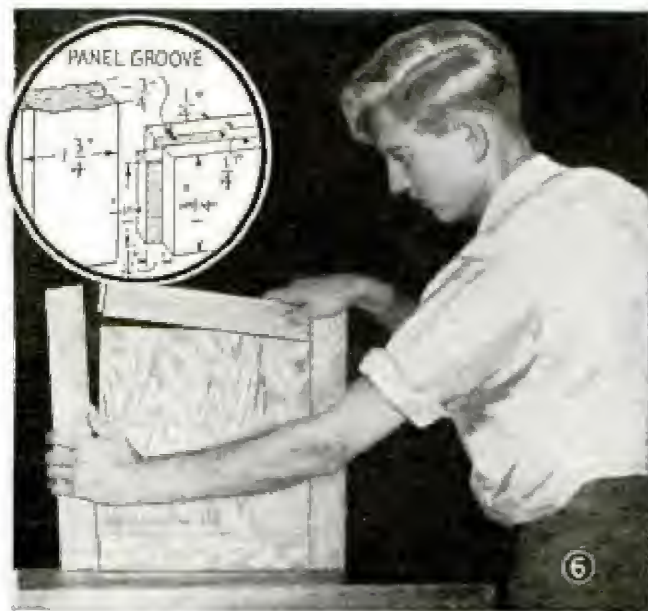
The sea chest is a beauty, and is just the thing in which to keep football clothes, boxing gloves, tennis rackets, etc. It is provided with a secret lock, so arranged that, though no key will open it, a slight movement of the escutcheon plate does the trick. Wide pieces of what is known as white-pine "shelving" should be obtained from the lumber yard. A few tight knots are not objectionable, but rather add to the appearance. Fig. 10 is a working drawing of the chest. Make the back and front pieces first. As the lid is sawed apart after the chest has been assembled, the side pieces must be wide enough to run to the top. It may be necessary to glue up this stock as the sides are 15 by 30 in. To provide sufficient stock to cut the joints, the ends are a full $18\frac{1}{2}$ in. wide at the top and the height is $14\frac{1}{2}$ in. The end pieces should be clamped together in a vise, as shown in Fig. 1, so that they can be planed to exactly the same size and shape. To make the dovetail joints, they are laid out and cut on the back and front pieces first. After scoring the line at the bottom of the dovetail with a sharp knife, start at the top of the piece and space along this line, $\frac{1}{2}$ in. then 1 in. all the way until the last one, which will be $\frac{1}{2}$ in. again. The slant,



which should be marked off with a T-bevel, is $\frac{1}{4}$ in. in each $\frac{3}{4}$ in. The slanting faces of the dovetails are sawed and the bottom chiseled out. If a $\frac{3}{8}$ -in. hole is drilled to remove part of the waste stock, it will speed up the work. The joints on the ends are marked by holding the finished side piece over it and marking through the dovetail with a knife or sharp pencil as shown in Fig. 16. Joints that do not fit snugly can be patched satisfactorily by gluing in bits of the same material. The patching should be done before the work is planed.

Construction of the lid is shown in Fig. 9. Three pieces of $\frac{3}{4}$ -in. stock are jointed and nailed into place after which a 20-in. radius is drawn on each end. The three top boards are planed to the curve formed by the arc to produce a rounded lid. After the top has been rounded, you are ready to saw off the lid. Start this from the corners, and gradually work toward the centers of the four sides. Handles for the chest are made by braiding three pieces of manila clothesline together. To stiffen the top of the lid and secure the joints, braces are added as in Fig. 15.

The secret lock is shown in Figs. 11 to 14 inclusive. A copper escutcheon, shaped as in Fig. 11, is cut out of $\frac{1}{16}$ -in. stock and hammered on the face with a ball-peen hammer for decoration, and then tarnished by holding it over a burner of a gas stove. When the escutcheon is finished, it should be mounted temporarily by means of a machine screw in the pivot hole shown in



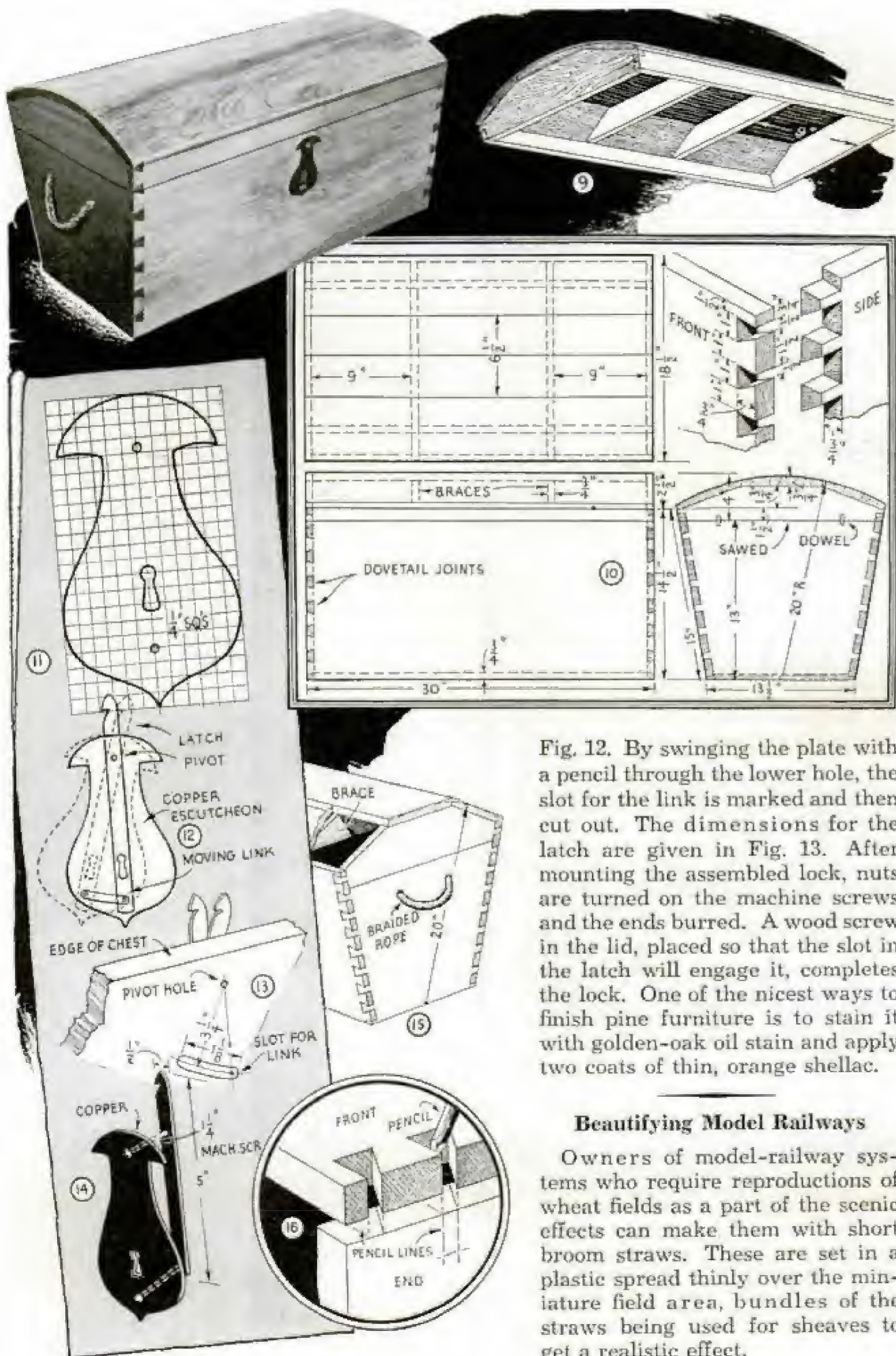
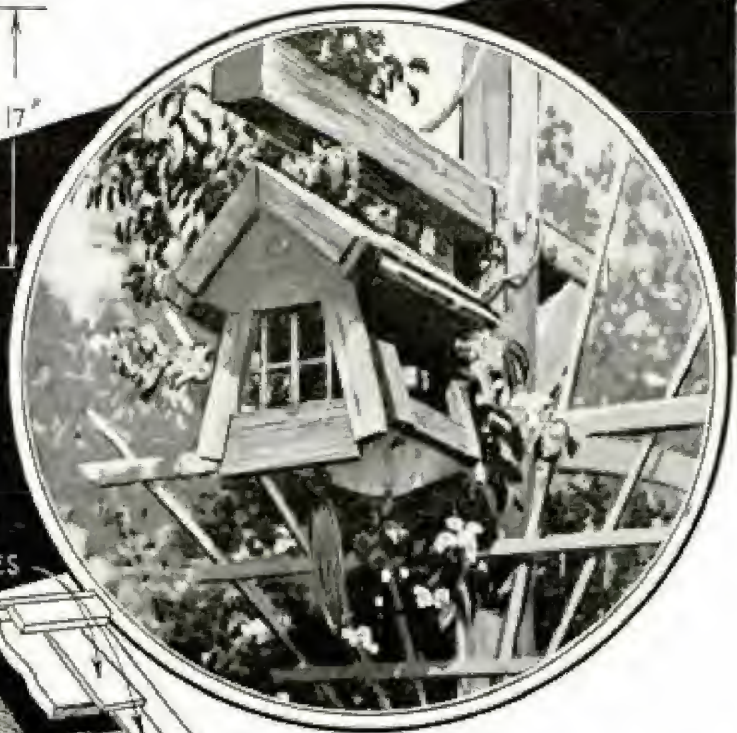
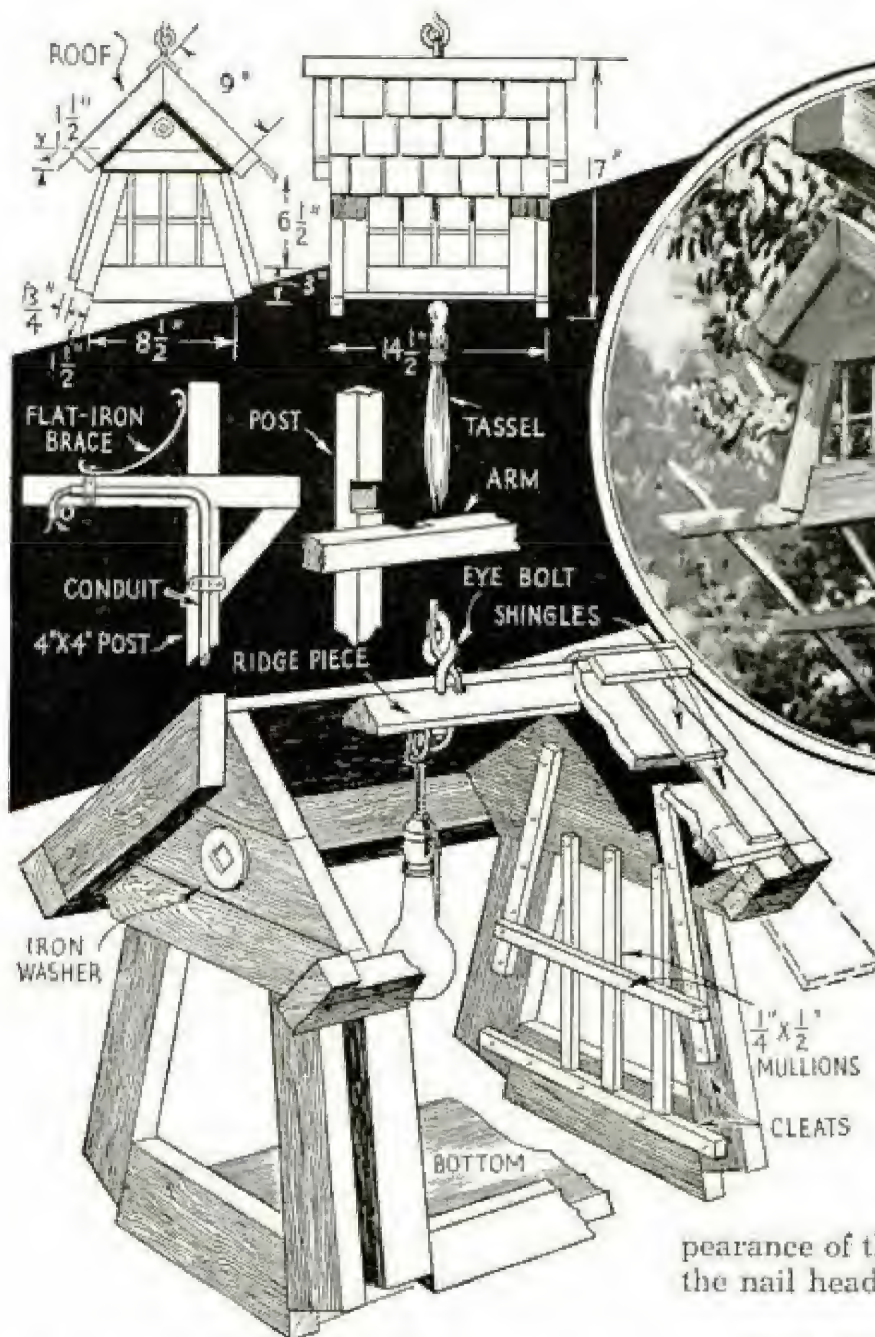


Fig. 12. By swinging the plate with a pencil through the lower hole, the slot for the link is marked and then cut out. The dimensions for the latch are given in Fig. 13. After mounting the assembled lock, nuts are turned on the machine screws and the ends burred. A wood screw in the lid, placed so that the slot in the latch will engage it, completes the lock. One of the nicest ways to finish pine furniture is to stain it with golden-oak oil stain and apply two coats of thin, orange shellac.

Beautifying Model Railways

Owners of model-railway systems who require reproductions of wheat fields as a part of the scenic effects can make them with short broom straws. These are set in a plastic spread thinly over the miniature field area, bundles of the straws being used for sheaves to get a realistic effect.

Old English Lantern of Wood for the Garden



The roof is sheathing boards with short shingles over them. The gable ends are decorated with iron washers, preferably those with square holes in the center. The washers should not be galvanized or nicked so that they will rust quickly and add to the weathered appearance of the lantern. Also, do not cover the nail heads for the same reason.

Swinging from a post at the rear fence of a garden, this weathered wood lantern of old English design is very picturesque. Construction is easy as the rough and uneven workmanship demands no accurate fitting. Select any material that will weather quickly, and cut the various pieces roughly. The ends are built up to form a gable with a window below, cleats being used on the inside to hold the pieces together, and mullions are installed in the manner shown. When both ends are completed, they can be assembled with the bottom and roof. Note the triangular ridge piece through which the eye bolt passes.

Simulating Port Lights on Midget Ship Models

Popularity of miniature ship models, of less than 4 in. in length, often brings up the problem of suitable port lights in proportionate size, as painted ones are difficult to apply with uniformity. An improved method is to drill shallow holes of proper size where the port lights are to be located. Then lill pins are clipped off about $\frac{1}{16}$ in. under the heads and these are driven into the holes and countersunk just a trifle below the surface. Light reflecting from the rounded surface of the pinheads makes them appear as glass port lights.



Hardwood Dibble Fitted with Depth Gauge Assures Flower Bulbs Being Planted Correctly

Gauge on Dibble Aids in Planting Flower Bulbs

Fitted with a gauge, this dibble assures that each particular kind of flower bulb will be set in the ground to the correct depth. The dibble is made from a hardwood stick, which is pointed at one end. It is drilled at intervals near the pointed end for the gauge, which is a short $\frac{1}{4}$ -in. dowel, the holes being spaced to get the depths for planting various bulbs.

Bottom of Pipe Flattened to Prevent It from Tipping

Unless a pipe holder is used, the average smoker finds it necessary to empty his pipe before laying it down temporarily. Any pipe can be made to rest with the bowl in a vertical position, when placed on a table or desk, by merely flattening the bottom of the bowl. This can be done with a file, or on a sanding disk.



☛ A narrow room appears to be wider if it has a chair or plate rail.

Improvised Hand Grips on Baskets

Cut in half and flattened, tobacco tins provide good emergency handles for carrying baskets and hampers that are not equipped with hand grips. The flattened ends of the tins are slipped under the bands around the tops of the baskets where they are held in place with small nails.—Frank W. Bentley, Jr., Missouri Valley, Ia.



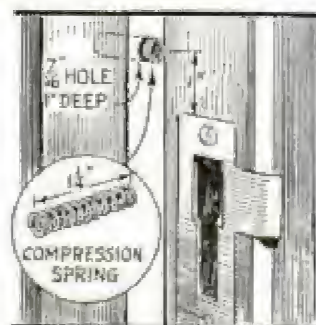
Rubber Sponge Keeps Fountain Pen Ready for Instant Use

When a fountain pen is carried in the pocket and not used for some time, it is often necessary to shake down the ink. As this may cause spattering of a floor or desk, it is best to avoid such necessity. To do this, cut a piece from a rubber sponge and trim it to fit snugly into the bottom of the pen cap where it will just touch the point of the pen when the cap is in place. This will keep the point moist.

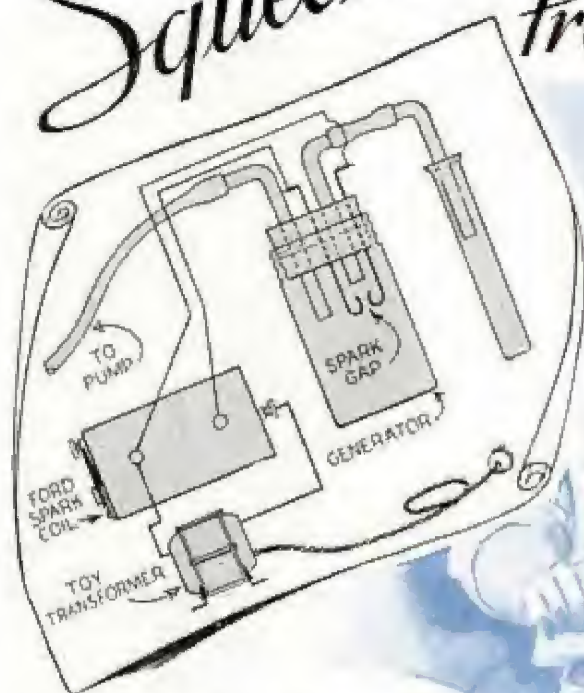


Spring Stops Door from Rattling

If you have been kept awake at night by the wind rattling a door, insert a small compression spring into a hole drilled into the jamb, which will stop the annoyance. A brad driven through the wood to engage the spring will keep it in place. As the spring projects only $\frac{1}{4}$ in., it is not noticeable, and there is no possibility of catching the clothes on it.—C. E. Packer, Chicago.

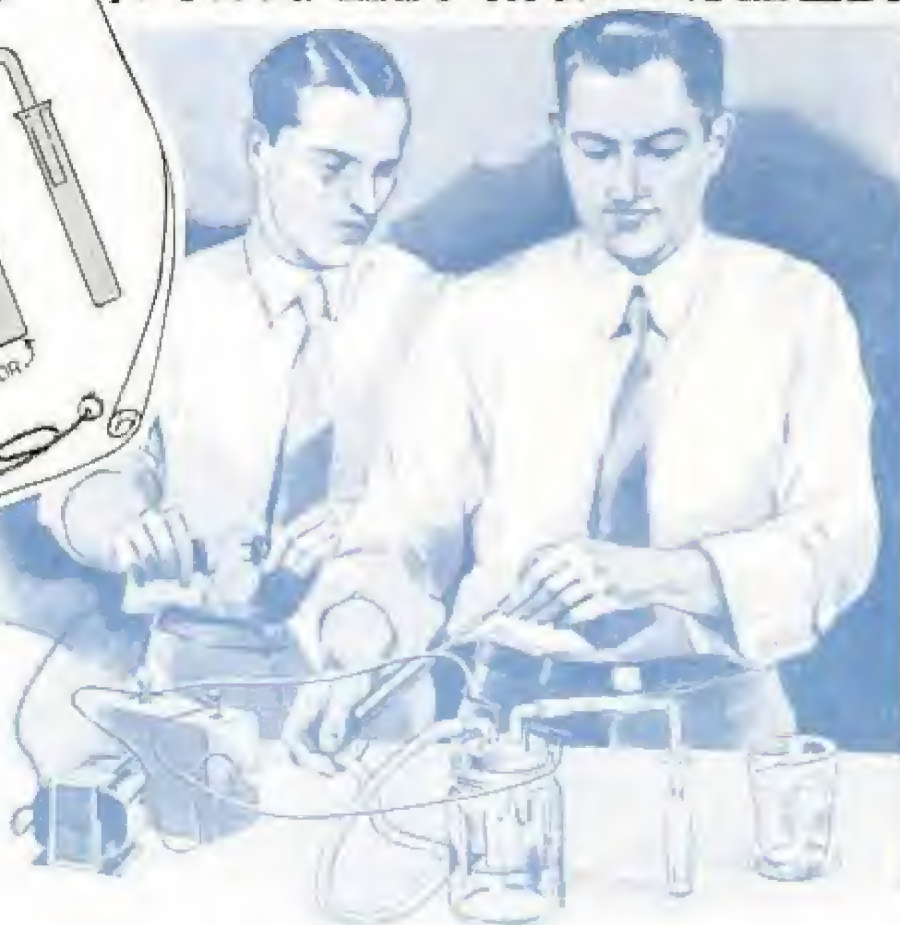


Squeezing **CHEMICALS** *from AIR and WATER*



By C. A. Crowley

Industrial Process of Making Fertilizer and Other Valuable Products Easily Demonstrated with This Simple Apparatus



GIGANTIC nitrogen fixation plants of the world can be reproduced in miniature in your basement laboratory; you can make the nitrogen and oxygen from the air combine to form nitric oxide and then use this new compound as the starting point in a number of experiments which include the making of nitric acid, one of the world's most valuable industrial chemicals. It is used in the manufacture of fertilizers, aniline dyes, celluloid, motion-picture film, lacquer, dynamite, collodion, artificial silk, and thousands of other necessities of modern civilization.

Apparatus for this experiment consists merely of an old Ford spark coil, a 6-volt transformer or three dry cells connected in series, a jar having a stopper fitted with two wires to form a spark gap and two glass tubes as shown, and a test tube containing distilled water. Air is forced slowly through the generator with a small bicycle pump and is exhausted through the water

in the test tube. While air is being passed through the generator, turn on the current so that sparks will jump across the gap. Keep the sparks going for about a minute and then turn off the current so that the wires will get a chance to cool. After repeating this procedure a number of times, there will be light brown fumes in the bottle. These are nitrogen peroxide, or the gas which combines with water to form nitric acid. The colorless nitric oxide formed in the spark gap has combined with oxygen from the air in the bottle to make this new substance. A strip of blue litmus paper dropped into the test tube of distilled water will change from blue to red, indicating that the bubbles of gas forced through the generator by the pump have combined with the water and changed into nitric acid. The longer the gas is passed through the water the stronger the acid will become. Upon removing the test tube from the generator you will find that



bubbles of gas are slowly given off when a small scrap of zinc is dropped into the tube and that the metal will be partly dissolved. The colorless solution that is produced inside of the tube by this action is called zinc nitrate.

In large nitrogen-fixation plants, which use thousands of kilowatts of electricity generated inexpensively by water power, the nitrogen peroxide made by a process similar to this experiment is pumped into large towers through which water is sprayed. The solution leaving the tower consists of strong nitric acid sufficiently pure for many industrial purposes. In nitrogen plants which furnish raw material for fertilizer the gases are passed through lime to make calcium nitrate instead of nitric acid. With the same simple apparatus this chemical is made by blowing the gases from the generator through a test tube about half full of ordinary lime water instead of distilled water. Lime water is the clear solution formed after a mixture of lime and clear water have been shaken together and allowed to settle.

The activity of nitric acid may be demonstrated by testing its action on metals. Into each of a number of small glass jars, set outdoors or on a window sill where the fumes will be blown away, pour concentrated nitric acid, filling about $\frac{1}{2}$ in. of

each jar. Then add an equal amount of water and drop into each jar a scrap of metal. For instance, in the first jar put a small piece of lead, in the second some copper wire, in the third iron filings, and in the other jars zinc, tin foil, or other metals. The acid will dissolve each, forming the nitrate of the metal. Nitric acid will dissolve all of the common metals except gold and platinum, but these may be dissolved in a mixture consisting of three parts of concentrated hydrochloric acid and one part of concentrated nitric acid. This mixed-acid solution is known as "aqua regia," and is extremely corrosive and ill smelling due to the chlorine which it gives off. When the acid in each jar has dissolved as much as it will, the excess metal is removed and the solution allowed to evaporate slowly. Beautiful crystals of the chemical compounds formed will appear in the bottom of the jars. The crystals from the acid in which lead was dissolved are lead nitrate (poison), those from the copper, copper nitrate, etc. In handling nitric acid, care should be taken to avoid getting it on the hands or clothing. It will turn the skin yellow, and if

not washed away with water or neutralized with soda water it will produce a severe burn. Clothing and other textiles as well as most paints and varnishes are destroyed by the acid. Waste acid may be poured through the sink if it is washed through with a large quantity of water.

Collodion may be made easily from nitric acid and a tuft of ordinary absorbent cotton. In a test tube or beaker pour one part of concentrated nitric acid and cautiously add two parts of concentrated sulphuric acid while stirring the mixture with a glass rod. The acids will get hot and

Small Tuft of Absorbent Cotton Submerged in Solution of Nitric and Sulphuric Acid for One Minute—First Step in Making Collodion

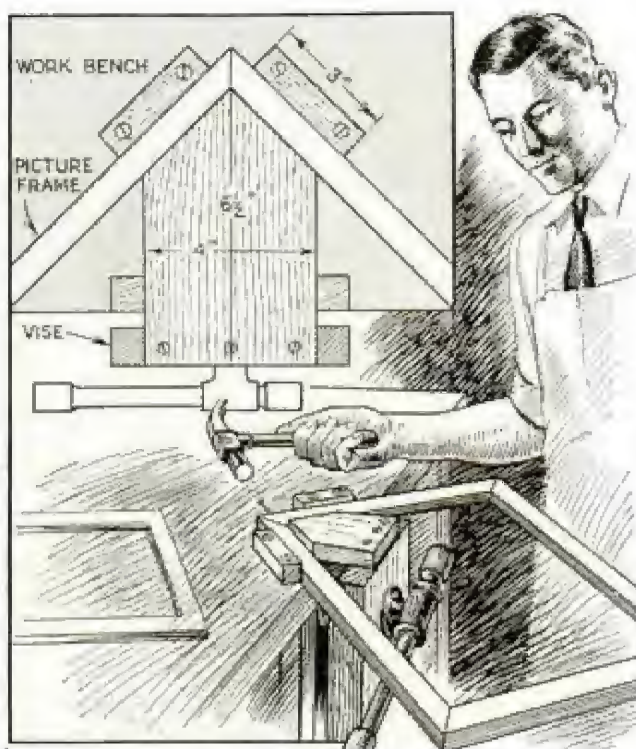


cotton is due to the fact that part of it has been converted into pyroxalin, or the grade of gun cotton from which celluloid, collodion and lacquer are made. If the nitrated cotton is shaken in a bottle containing about an ounce of a mixture consisting of equal parts of alcohol and ether, most of it will dissolve to form a solution of collodion. The residue that does not dissolve is cotton which

must be allowed to cool before they are used. Into the tube of cool mixed acids immerse a small tuft of absorbent cotton held on a stick for exactly one minute and then remove it and wash thoroughly in running water. The nitrated cotton should next be squeezed to free it from excess water and allowed to dry in the open air on a piece of clean white paper. When the nitrated cotton, or nitro-cellulose as it is called, has dried, place a small piece of it beside a dry tuft of untreated cotton on a metal or stone slab and set both on fire with a match and note the rapidity with which the treated cotton burns. The increased speed of burning of the treated

was not acted upon by the acids. The clear solution or collodion may be tested by pouring a few drops of it on a piece of glass and allowing it to evaporate, which will leave a clear film on the surface of the glass. This solution is made flexible for surgical uses by adding a small amount of castor oil.

Another safe but spectacular demonstration of nitric acid's vigorous chemical action may be performed by pouring a few drops of fuming nitric acid into a small open glass vessel, or better a porcelain dish, placed in a sink or out of doors and adding turpentine drop by drop from the end of a long glass tube.

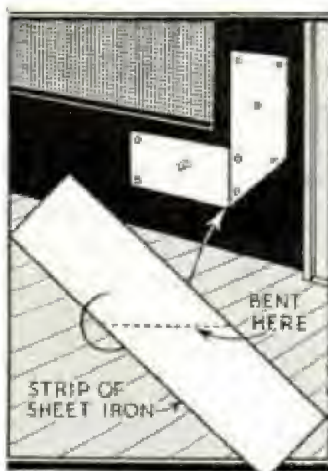


Device for Clamping Picture Frames Made by Nailing Wood Blocks to Top of Vise and Bench

Clamping Device for Nailing Picture Frames

Consisting of three small wood blocks screwed to the top of the vise and workbench as shown, this clamping device securely holds sections of a picture frame while nailing or gluing them together. The positions of the blocks on the bench may be altered to suit the work.

Sheet-Iron Strip Braces Screen Door



To brace a sagging screen door without fastening a wire or wood strip across one corner, take a strip of tin or sheet iron, fold it on the line indicated in the drawing and tack it over the lower corner of the door frame. The outer edge of the door is lifted up or pushed on a wedge while the brace is being nailed in place.

☛ Liquid tar thinned with gasoline makes a waterproof top dressing for car or truck.

Celluloid Funnel Holds Filter Paper

A strip of heavy celluloid, such as is used in side curtains of open cars, can be made into a very useful funnel for filtering chemicals in the home laboratory. Cut the celluloid to the right size, and then cement the ends together. Either clear lacquer, or lacquer thinner can be used for cement. As shown, the lower part of the filtering cone does not touch the funnel.



Making Glossy Photo Prints

If you find yourself in need of a glossy photo print, and have only dull-finish paper on hand, you can remedy the situation in the following manner:



Dissolve in some carbon tetrachloride, a good quantity of paraffin or candle wax. Clean off the squeegee board and apply the mixture to it, rubbing the latter to a high polish.

Then roll the wet print on the board, applying plenty of pressure, and remove the print and let it dry.

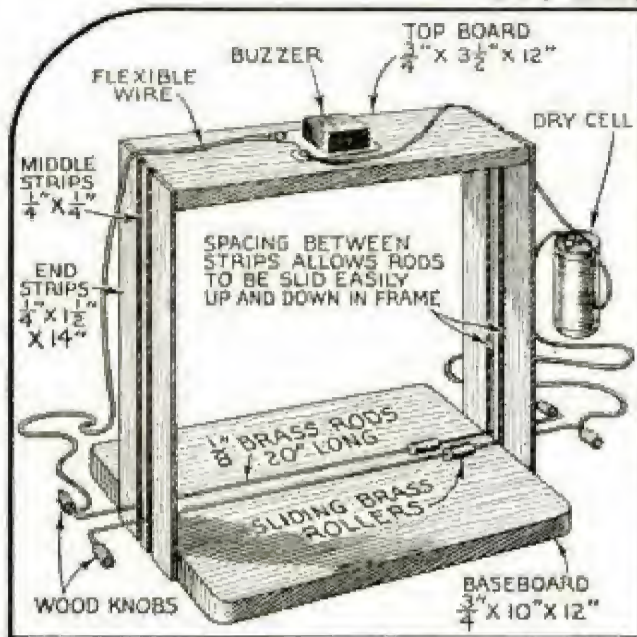
Scissors Sharpened on Glass Tumbler

When a stone or grinder is not at hand, a pair of scissors may be sharpened by drawing the blades across the edges of a glass tumbler with a cutting motion. A piece of broken window-pane will also serve the purpose.



Game That Requires Quick Arm Movement

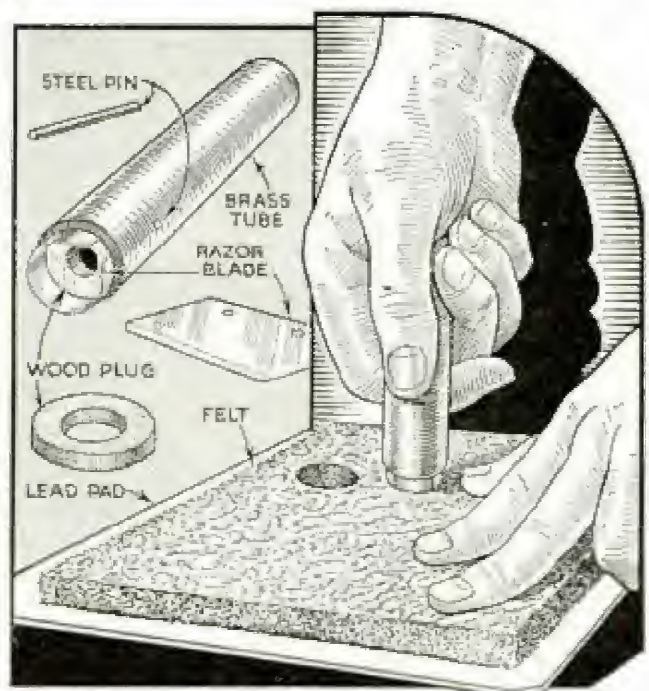
Supported on a wood base, which rests on the knees of the players, this game of contact will test your skill in dodging the maneuvers of your opponent. A frame having vertical side strips, spaced apart, allows rapid raising or lowering of two brass rods, which are



contact roller to slide into touching positions with that of his opponent, who strives to avoid being touched. Flexible leads, connecting buzzer and dry cell, are soldered to the ends of the rods, which are bent at right angles. Hardwood knobs are then drilled in the ends to fit tightly over them to serve as hand grips for the players. —J. Modroch, Chicago.

Homemade Tool for Cutting Holes in Flexible Materials

Having various sizes of holes to cut accurately in felt, leather and rubber, I made this simple tool, which consists of a short brass tube with a safety-razor blade inserted into one end. To make the tool, anneal the blade and insert it into the tube, leaving the sharp edge project as shown. The blade is held in place by means of a wood plug or washer, held in place by a steel pin, which prevents the plug from being pushed back into the tube. The pin is riveted into a small hole drilled through the tube. In use, the work is placed over a lead pad, after which the hole is cut by pushing the tool into the material. —Philip A. Eyrick, Belmont, Mass.



Inner soles cut from inner-tube rubber help to soften callouses on the feet.

Seeing Your House



Whether you intend to build a new home or remodel the present one, it is often rather difficult to visualize it before completed, even from the usual plan and elevation drawings. But there is a way—a very simple and inexpensive way—whereby you can see just how your house will look. Models made of paper will serve the purpose admirably. Perfect imitation in all details is not necessary. What you are most interested in are the proportions, colors, grouping of windows, etc., and model houses built of cardboard will give you all of this.

model is completed it may be set up on a base, which represents the lot, and landscaping touches in miniature added. Trees, hedges and shrubbery are imitated with bits of branches, weeds and plants, while walks, roads and terraces are made of sand. Only a few tools are required for

this work, and you will find it very simple and extremely fascinating.

In order to do this work, you will need a drawing board about 16 by 24 in., or larger, a small T-square having a 2-ft. blade, a triangle, architects' scale showing $\frac{1}{4}$ in. to the foot, a draftsman's ruling pen, penholder fitted with a new pen, a bottle of black drawing ink, pencils and a box of small, cheap thumb tacks. A black-carbon pencil will be useful for blackening in the window panes, and a box of colored-wax crayons or water-color paints to color the finished house. You will need paste also, and a brush to apply it, a pair of scissors, a catalogue of doors, windows, several grocery cartons, pins and a number of other miscellaneous items, depending on just how detailed you intend to make the model.

In laying off the floors and walls, you have to draw these to scale. This may be done in pencil, but all drawing must be worked out carefully and accurately, so that the dimensions will come out right.

THE method of making model houses of paper as described in this article, consists briefly of first drawing the plans and elevations on paper at the regular scale of an architect's working drawings— $\frac{1}{4}$ in. to the foot—and pasting these plans and elevations on corrugated cardboard, which then are cut out and fitted together. Roofs and dormers are cut from the same material, while porch pillars, chimneys and similar items are made of wood. When the

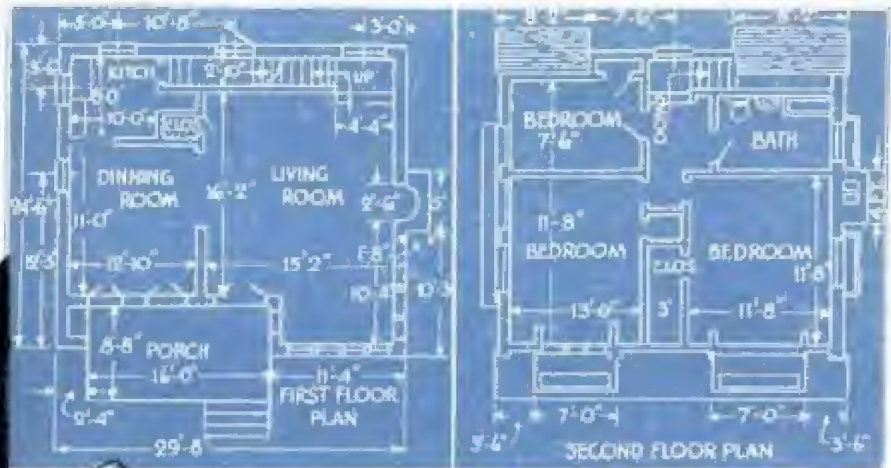
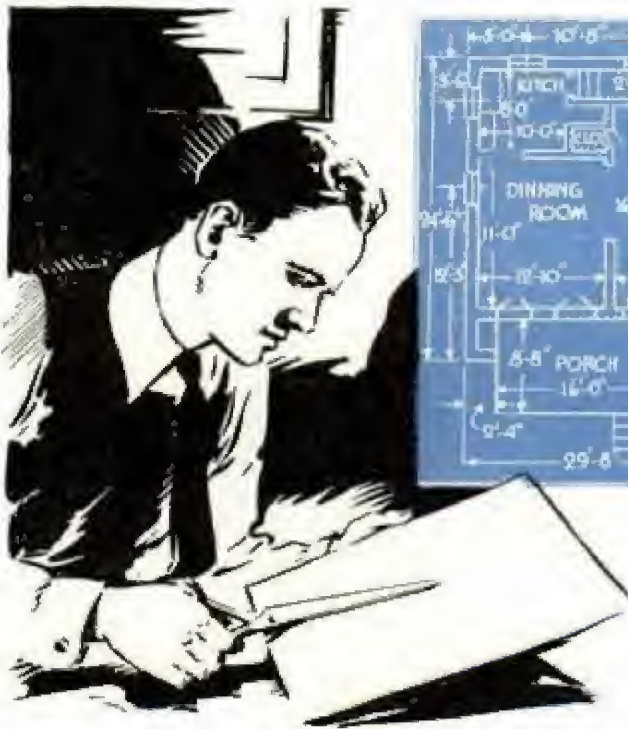
before It's Built



If complete architects' plans are available, it is a comparatively easy matter to lay a sheet of tracing paper over them and trace them. If you have a remodeling job in view, all dimensions of your home should be drawn to scale, $\frac{1}{4}$ in. to the foot. In this case it will be necessary for you to take actual measurements of the house. Start with the first-floor plan, allowing for the thickness of walls and partitions. When you are drawing plans, it should be remembered that wooden partitions, including plaster, are 6 in. thick. Those who are unaccustomed to drawing plans often forget to allow anything for a partition; hence their rooms do not work out properly when the house is built. An outside frame wall, clapboarded or stuccoed on sheathing, is 7 in. thick, while a brick, tile or cinder-block wall, including the plaster, is about 9 in. thick. Also be sure to locate and draw all doors and windows exactly to scale. For the second-floor plan, fasten a piece of tracing paper directly over the first-floor plan, trace the outside walls, and put in the windows. Then you can see ex-

actly how much area you have, where the stairs and chimneys come, and so on. If you are not satisfied with the arrangement, it is a simple matter to remove the sheet of tracing paper, apply another and begin over again. This is much easier than erasing the work and making changes.

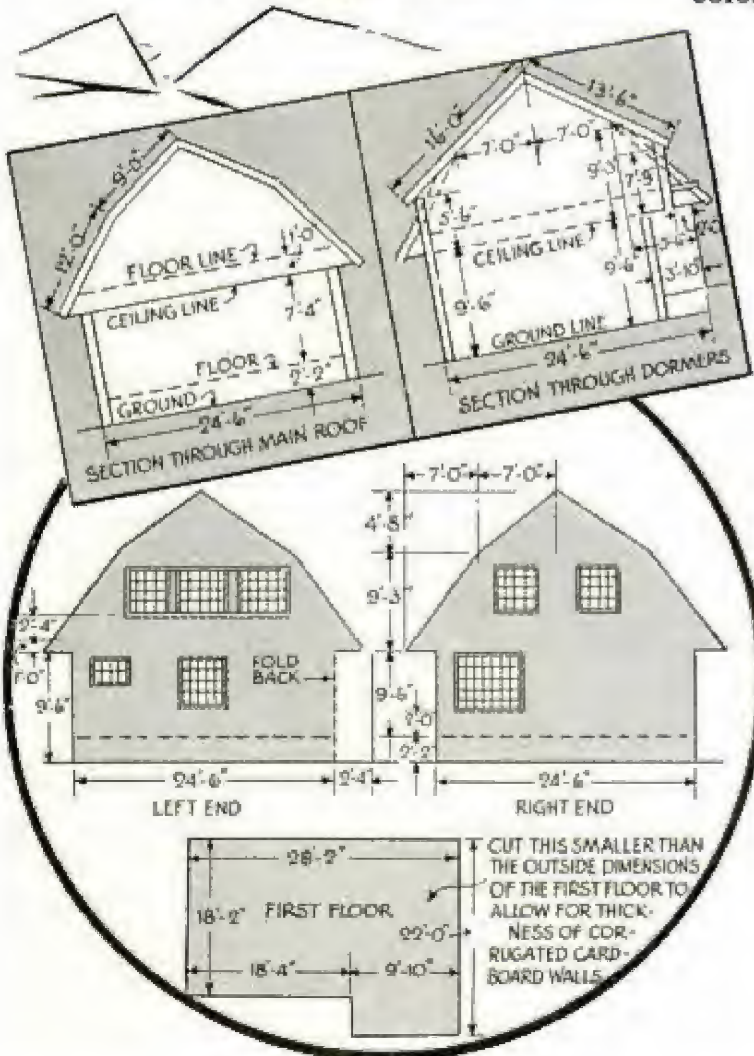
After completing the floor plans, all accurately drawn, with the outside dimensions and window locations figured, you can proceed with the elevations. With a Dutch colonial house, which is shown in the accompanying illustrations, the roof pitches are very important, and a little change in the angles will make all the difference between beauty and ugliness. But before deciding on the roof pitches of a house of this type, it is necessary to draw one or more cross sections through the house at the same scale of $\frac{1}{4}$ in. to the foot, in order to tell whether or not you will have sufficient head room in the second-floor bedrooms, or above the stairway. Then tack down a sheet of white letter paper and draw one end of the house, and, after checking carefully for position of



the sill above the floor is important. In drawing a window, make double lines to represent the wooden strips between the panes. Then black in the panes. Now draw the other end. The front and back are similarly finished. In case of the Dutch colonial house shown, the dormer windows at the front are somewhat unusual. Instead of projecting out, they are recessed back into the roof. Otherwise, to get the dormer window sills low enough and the tops of the sash high enough, they would project in front and have very flat roofs, utterly out of proportion.

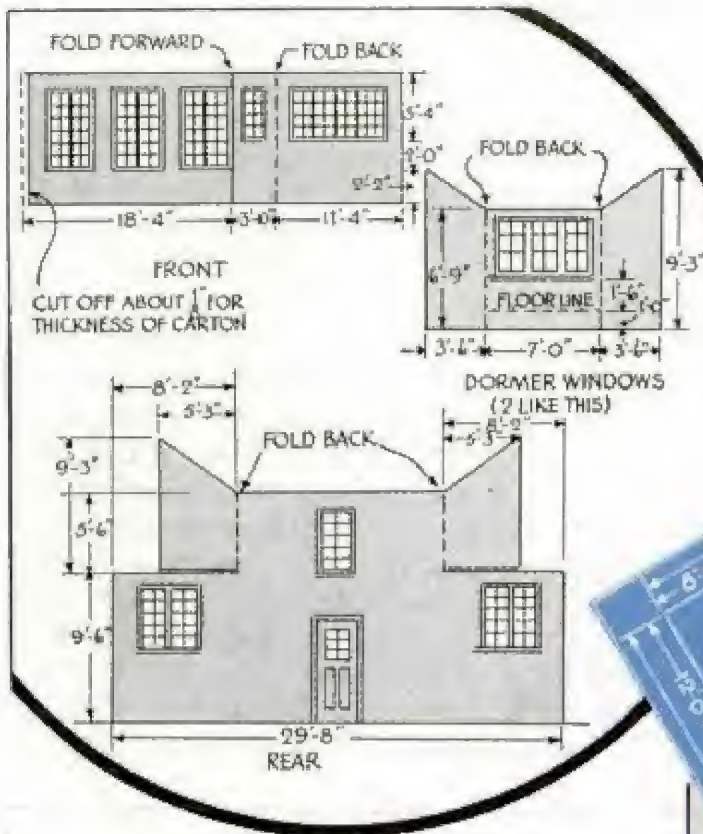
When all floor and elevation plans have been completed, the floors are cut out of $\frac{1}{16}$ -in. corrugated cardboard boxes, the elevations are pasted on the same stock and cut out, making proper allowance at the corners and other joints. Next comes assembling, which is done with the help of pins and glue. The roof is placed on last. By the time you get to this part, you will have had sufficient experience in fitting and cutting to proceed without further explanation as to procedure.

There is, of course, unlimited possibility of detail work. You can paint the house any color you desire and the color of the roof can be applied also. Window boxes may be added, and, when the house itself has been gone over to



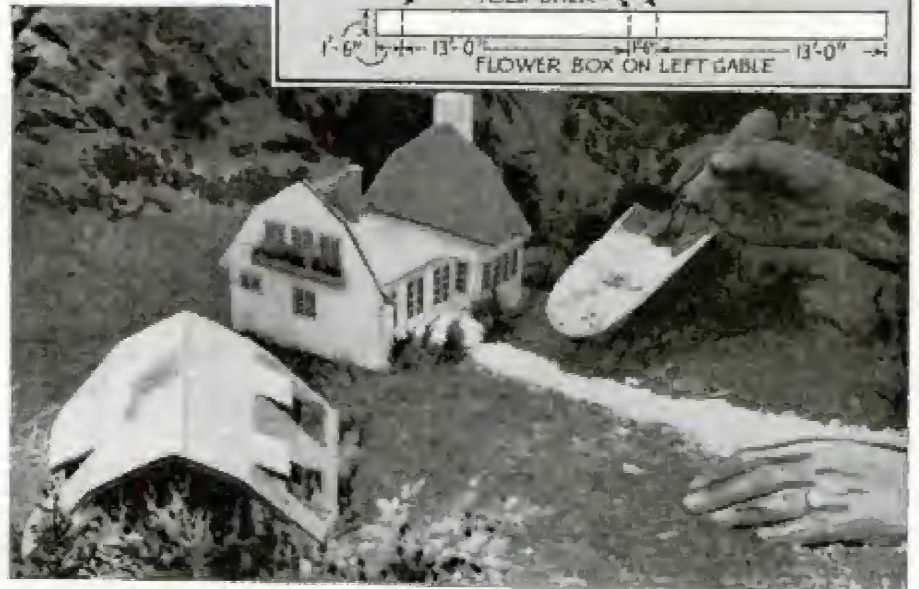
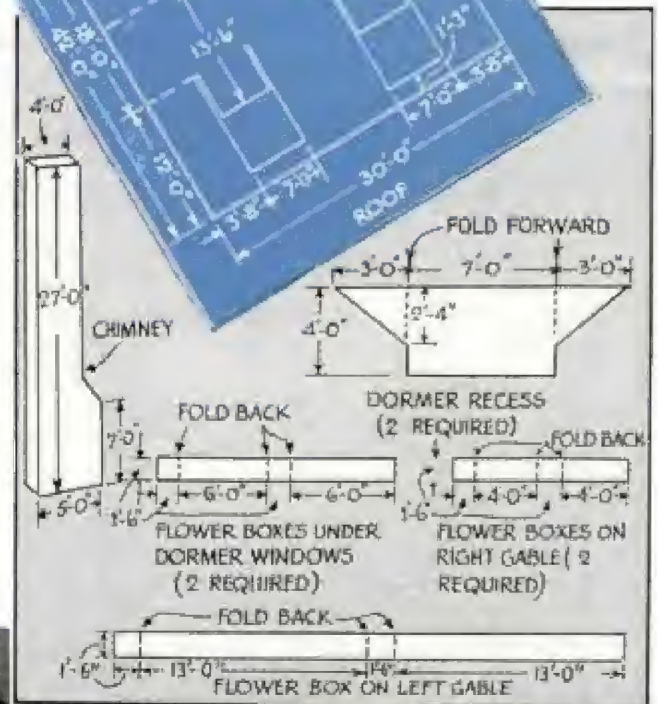
windows, etc., ink them in. As stock windows are much less expensive than special ones, look over the millwork catalogue, and pick out standard sash. The height of

your liking, it is set on a suitable base, which is the proportional size of the lot, allowing, like the house, $\frac{1}{4}$ in. to the foot. Next come the landscaping, terracing, etc.,



to make the model appear as realistic as possible—a miniature, but nevertheless your house as it will look when completed. And, if you don't like it, you can change it to suit your fancy, or you can discard it and build another at practically no cost, and but a few hours of your time.

Architects will find that they can adapt this house-modeling idea to their work, thus giving their customers a better conception of the proposed building. A model will be found to work in especially well when designing a home for a customer who, because he is not familiar with reading of plans and blueprints, experiences difficulty in visualizing the completed house. A few models of modern homes made up and set in show windows, will be interesting to customers of lumber dealers in small towns who are often called on to assist in designing a home. These dealers may find it profitable also to show models of old houses both before and after modernizing.



Starting Camp Fire with Wet Fuel



Small Pieces of Resin Carried in Canvas Bag for Quickly Starting Camp Fire with Damp Fuel

To avoid being caught in a rain without dry fuel for starting a fire, the novice camper will find it advisable to follow the method used by an experienced woodsman. He carries a canvas tinder bag that has been impregnated with boiled linseed oil, and, when passing a gnarled pine tree on which there are hard deposits of resin, cuts off a few nuggets and puts them in the bag. Then, if he is caught without dry fuel, it is a simple matter to start a fire in a short time. To do this, find a dead log or branch, flatten a portion of one side with an ax, and make a small trough in the flattened portion to hold a handful of the resin nuggets. Then slant a number of the driest twigs that can be found against the log as shown, and ignite the resin. This will burn readily and will ignite the sticks soon, after which more fuel is added.—Ben C. Robinson, Newcomerstown, O.

“WHAT TO MAKE” Popular Mechanics Craftsman's Guide

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Check full of illustrations showing hundreds of useful and interesting things you can make, besides valuable and practical information that every home craftsman should have at hand. Whether you are interested in making things for the home, in building boats, models, toys or garden furniture, this standard reference book will be found indispensable. Also tells how other craftsmen have built up their spare-time efforts to money-making enterprises. You can do the same!



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VITAL WORKSHOP REFERENCE DATA such as workbench construction, proper selection of tools, sharpening tools, taking correct measurements, motorizing your workshop, etc.

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COMPLETE LISTING OF POPULAR MECHANICS WORKSHOP BLUEPRINTS, showing a picture of nearly every article as it will look when finished—383 things to make—ornamental shelves, tables, chests, chairs, hall clocks, cabinets, bird houses, lawn chairs, fences, trellises, arbors, toys, novelties, ship and train models, radios, rowboats, outboard racers and pleasure boats, metal work, electrical projects, home workshop machines, etc.

POPULAR MECHANICS MAGAZINE, Dept. B.P.A.
200 E. Ontario Street, Chicago, Ill.



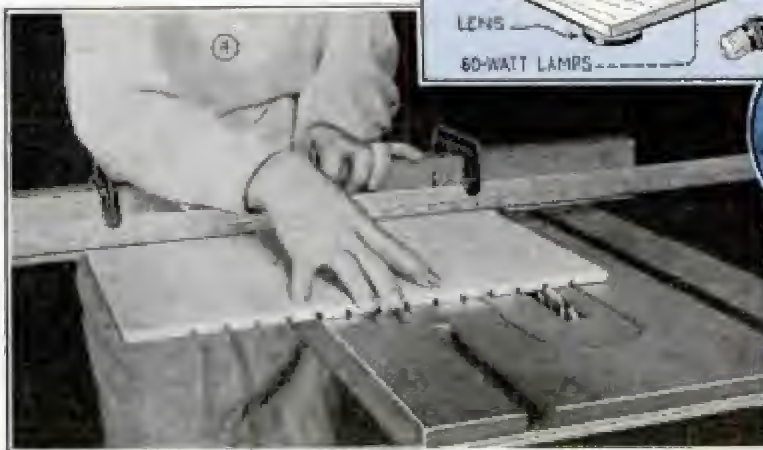
A Simple PROJECTOR for the Shop

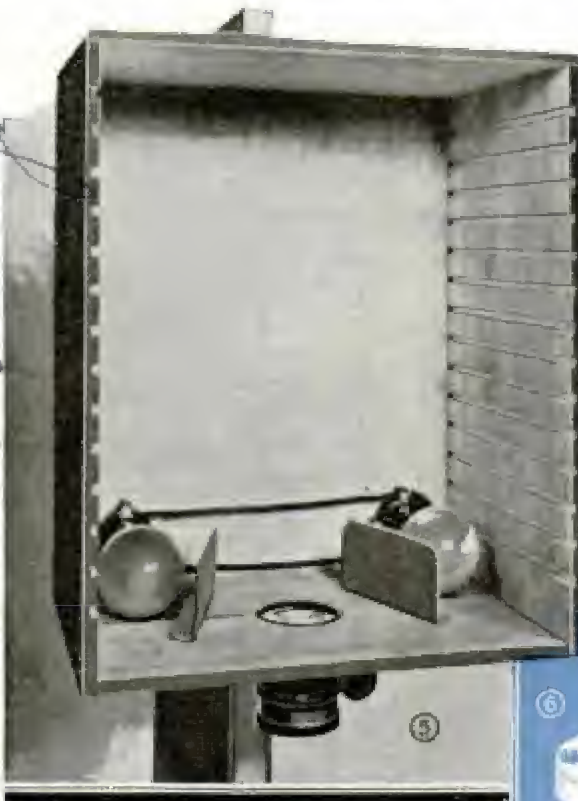
CRAFTSMEN who have encountered rough going and unsatisfactory work from the standard magazine method of showing patterns in reduced squares, will appreciate the value of this simple projector. The whole outfit, right down to the lens, can be made at a cost of little over one dollar. With this unit in your shop, you can project plans or patterns immediately to almost any size within reason.

Construction starts with the simple box which carries the lights and lens. This can be almost any size, the dimensions given in Fig. 2 being a fair average. The original was made from an apple box, the sides being removed to permit cutting



the dado grooves, as shown in Fig. 4. These take a copy board, and permit adjusting it for height. In addition to the copy-board grooves, there is little else to the box except two sockets and lights, and the tin shields which keep direct light from the lens. These are shown in Fig. 5. Reflectors behind the lamps will add some to the illumination, but are not essential. In use, it is necessary that the box be adjustable from about 2 to 4 ft. above the table or bench, on which the copy is projected. The





adjusting feature is built into the simple bracket, Figs. 2 and 3, which supports the box on a wall above a table or workbench, as shown in Fig. 1. The U-shaped section of wood strips slides up and down the heavy upright piece, and can be clamped readily, at any height above the table desired, by tightening the wing nut.

The lens, of course, is the most essential feature. Regular projection lenses can be purchased at a reasonable price, but equally good results can be obtained from almost any reading or magnifying glass. The only disadvantage to the latter is the fact that it will show distortion at about six diameters. As the average work is only to 3 or 4 diameters, this is of little importance. To make the lens, get a fair grade reading glass about 2 in. in diameter. It will cost about fifty cents. Unscrew the handle to release the glass. Then, turn a wood cylinder about 4 in. long and to the same diameter as the lens. Around this cylinder, bend and solder a piece of tin to make a tube 4 in. long. Hammer or spin one end of the tube to form a flange, which will prevent the lens from falling out. Next, you will need a wood collar in which the tin tube will slide. This can be made by drilling a 2-in. hole in a suitable piece of wood, and then slipping the wood

over the cylinder already in the lathe for further turning, as shown in Fig. 7. Fig. 6 shows a cutaway view of the homemade lens. The wood collar is fitted and screwed from the inside of the box, and is lined with felt so that the tin tube carrying the lens will be a good sliding fit.

In use, the copy to be enlarged is tacked to the underside of the copy board. If desired, the copy also can be held between two panes of glass. In either case, the board or glass is slipped into any pair of grooves in the box. The lights are then



turned on and adjustments made to bring the copy to the required size, and in sharp focus. The size is governed by the height of the box on the bracket and by the position of the copy board, the focus being made dead sharp by sliding the lens inside the wood collar. A little practice will give you exact scales of sizes, which can be marked on the box and bracket for future reference. This type of projector reverses the copy. Where it is necessary to have the tracing face the same way as the original, the simplest plan is to use carbon paper. This is placed face up on the drawing board, and the tracing made on thin paper so that the carbon makes an impression on the underside of the paper as the pencil draws the image on the upper side.

Reel + Howell
1801
Larchmont, Chicago

Inexpensive Paint Striper Made from Brass Tube and Compression Oil Cup



sage for the paint. A gauge, or steadyrest, is made from wire and fastened to the tool by means of a short brass rod, which fits in a hole drilled through the tube. This rod is drilled and tapped in the ends for set screws, or thumbscrews, to permit adjustment of the gauge. A cap to slip over the end of the tool and protect the roller when not in use, completes the job.—Denu Erickson, Iron Mountain, Mich.

Cardboard Gauge with Scale along One Edge Helps to Determine Copy Space on Mimeograph Stencils



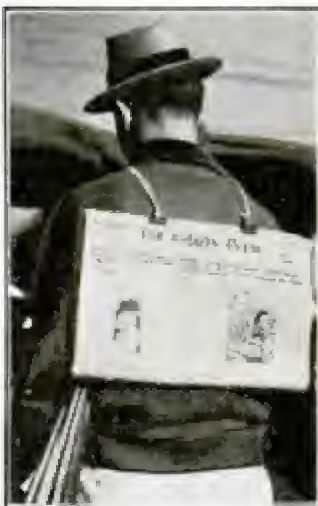
Fastened Together by a Bolt and Pipe Spacer, This Milk Stool Is Light and Rigid

Novel Milk Stool Made from Pipe and Auto Steering Wheels

Two old auto steering wheels, which can be picked up at any junk yard, provide a light, rigid milk stool when assembled as shown. The wheels are spaced with a short piece of pipe and then fastened together with a long bolt. A burlap cover stretched over the upper wheel and attached to the rim with large tacks, provides a soft, comfortable seat.

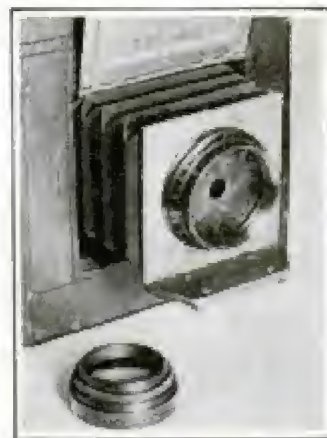
Unusual Method of Displaying Newspaper Headlines

Newsboys at street intersections in Los Angeles, Calif., have improvised a simple method of displaying the headlines to customers as they hurry among cars, which have stopped for light signals. Strong paper clips tied to the ends of a cord passed over the shoulders and around the neck, hold a sample paper on the back as shown. Besides promoting sales, the newspapers serve as a safety factor by making the boys visible to motorists from a greater distance.



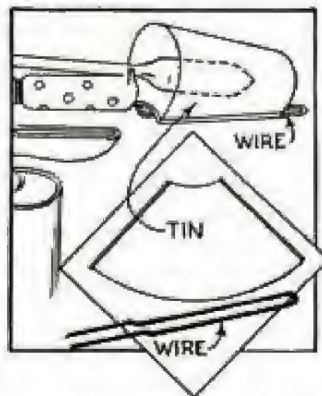
Enlarging Copy Work with Camera

By removing the front lens element of some cameras, it is possible to copy work and enlarge it one-third of its original size. To do this, the camera must have sufficient bellows extension to accommodate the focal length of the rear lens element, provided the lens elements can be separated, and are of different focal length. If your camera is of this type, then it is just a matter of focusing to get a clear, sharp image on the ground glass before making the exposure.—J. E. Russell, Scranton, Pa.



Shield Conserves Heat of Blowtorch When Used Outdoors

To conserve the heat of a blowtorch, when it is used outdoors for soldering jobs, a simple tin shield may be fastened over the heating tube. The tin is cut like the pattern shown, after which it is bent to a funnel shape and the sides crimped over a U-shaped wire. By inserting the ends of the wire inside the heating tube, the shield is supported in position to direct and conserve the heat of the flame around the soldering iron.

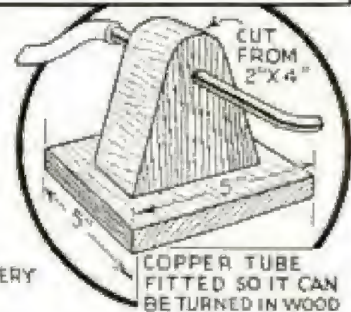
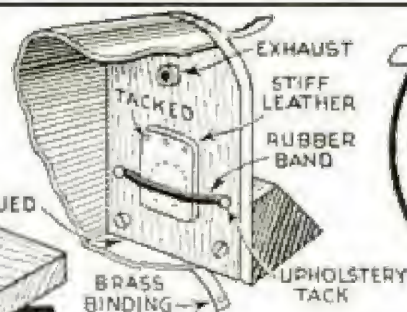
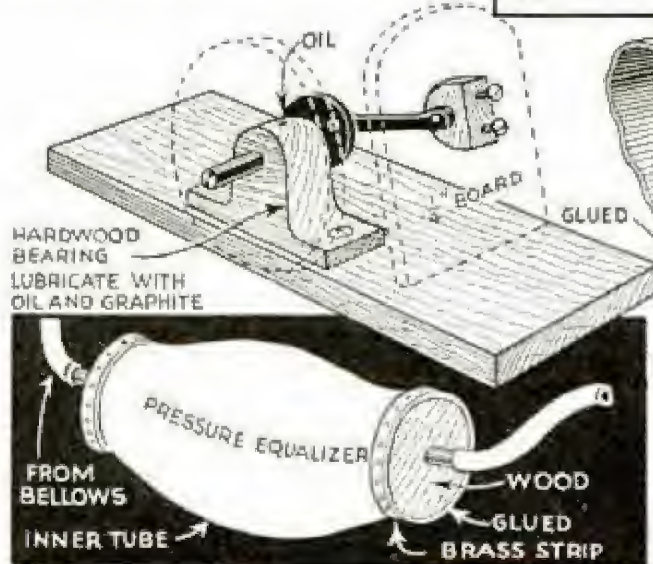
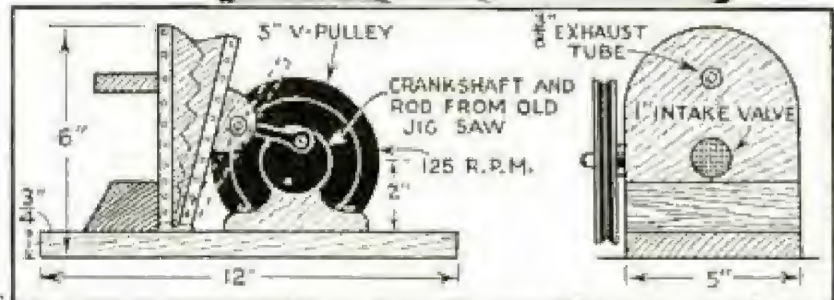
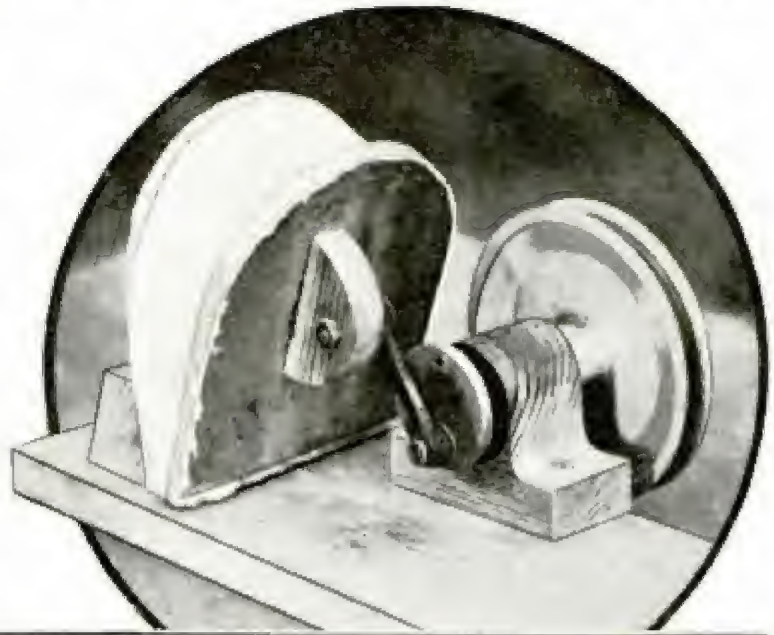


Growing Tomatoes That Have Few Seeds

When pruning tomato plants in the spring, do not throw away the removed shoots. Place them in pots or cans, filled with half soil and half sand, water thoroughly and put in a cool shady place. In a few days, the growth will take root, producing a new plant, the fruit of which, it is claimed, will not have as many seeds as those of the parent plant.

Workshop Bellows Driven by Small Motor

Here is an efficient little blower that can be screwed under the workbench, out of the way, and serve all tools through a long tube. The crankshaft and connecting rod of an old jigsaw were used in the original model, but these parts can be made up of an iron bar and hardwood. The unit is mounted on a block of wood, a piece of hardwood serving as a crankshaft bearing. Lubricated with oil and graphite, it will function well at the moderate speed of 125 r.p.m. Soft, thin leather is best for the bellows, although oilcloth, shown in the photo, will last for a while. The leather is glued to the wood sides and further fastened with a strip of brass or aluminum tacked over the edges. Before putting on the leather, bore a 1-in. hole for the intake. Over this, on the inside, tack at one end a piece

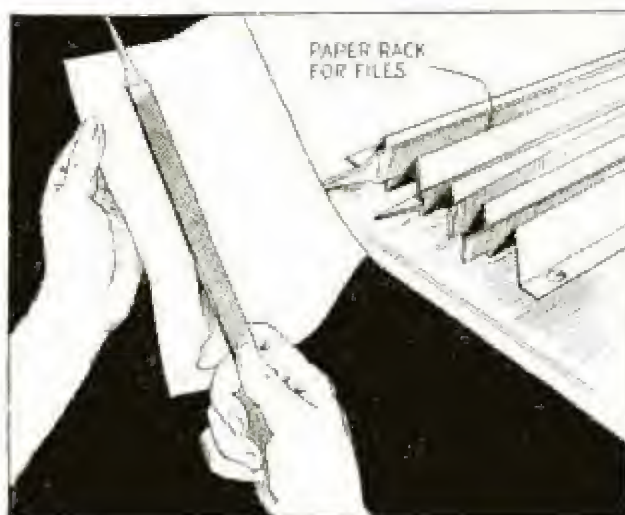


standard. It should be a snug fit, so that it can be twisted, but will remain in the desired position.

Shop Blueprints Protected with Tin Backing

of stiff leather and stretch a rubber over the other, as indicated. No check valve is necessary over the smaller exhaust tube. Note that the board with the intake valve is fixed rigidly, while the other moves back and forth. As the air stream will be delivered from the bellows in puffs, an equalizer can be made of a 12-in. section of inner tube installed in the air line. A portable nozzle is made by bending a $\frac{1}{4}$ or $\frac{3}{8}$ -in. copper tube in a curve, and installing it in a block of wood in the form of a

Instead of pasting shop drawings and blueprints on a piece of cardboard to help protect them, one foreman mounts them on a sheet of tin. A good paste for this purpose is made by stirring rice flour into boiling water until the mixture thickens, after which glycerine, 1 oz., is added for each pint of paste, and thoroughly mixed. This paste is adherent and will not peel from the tin. After the drawings have been mounted and allowed to dry, they are given a coat of clear, waterproof varnish.



Cutting Surface of Files Protected by Paper Wrapping When Stored with Other Tools

Paper Protects Files

An old established file-manufacturing firm advises the user to protect the edges of files from tools that are being used or stored with them. For this purpose, a holder may be made from heavy wrapping paper or light cardboard. Sheet fiber, such as is used in making gaskets, is also ideal. If you are busy, don't waste time in making neat folds. Just take the end of the paper in your left hand, drop the first file into the palm, close up your hand on it, and repeat with the next file.—Geo. Nealley, Santa Rosa, Fla.

Flexible Metal Covering Shields Soldering-Iron Cord

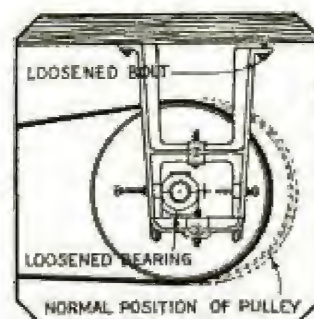
To prevent a cord on a soldering iron from wearing at the point where it enters the handle, which often results in a short circuit, either substitute a metal-sheathed



cable for the present cord, or protect it with a short length of flexible metal covering. If the latter method is used, remove the handle from the iron and enlarge the hole in the end to take the covering. A fiber bushing is slipped over the cord and pushed into the free end of the covering where it is taped in place to protect the wires at this point.—D. A. Allaire, Brooklyn, N. Y.

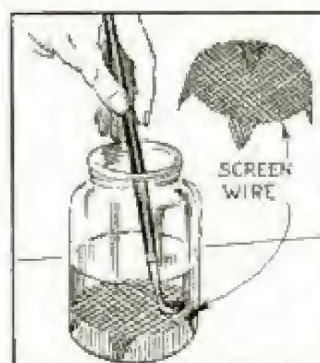
How to Put Belts on Pulleys

Most experts agree that it is poor practice to put on a large belt by forcing one edge over a rotating pulley, as this stretches one side and ruins the belt. This may be avoided, where conditions permit, by loosening one of the adjusting bolts on the shaft hanger as shown, so that the belt can be slipped over the pulley, after which the bolt is tightened. Before loosening the bolt, the position of the hanger should be marked to avoid tedious work of re-aligning the shaft after the belt has been put on.—W. F. Schaphorst, Newark, N. J.



Screen Wire Aids in Cleaning Artists' Brushes

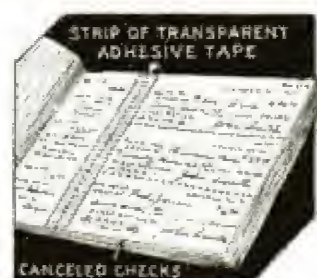
By using a screen-wire disk in the bottom of the cleaning jar, artists will find they can clean their brushes without stirring



up sediment that has collected in the jar. When cutting the disk, leave four triangular projections evenly spaced around the edge so that they can be turned down to serve as feet.

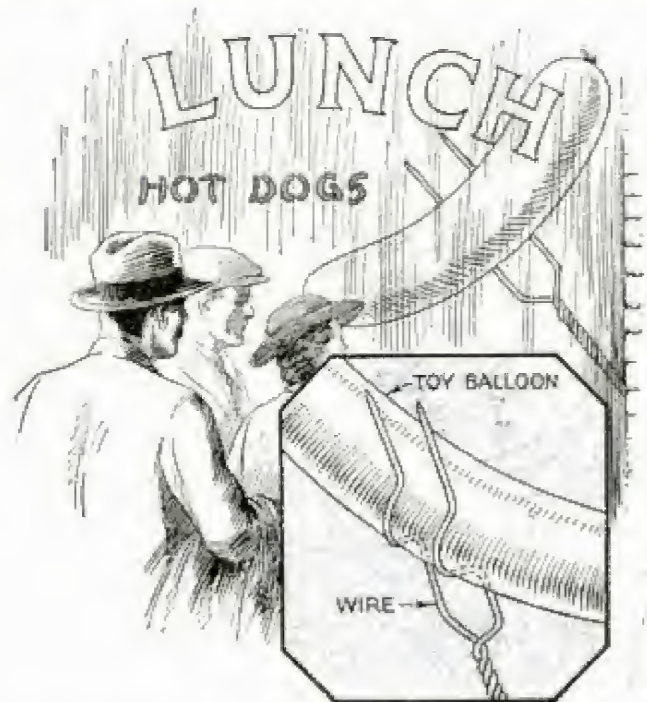
Handy Method of Filing Checks

Instead of bundling your canceled checks and filing them away in drawers, attach them to their respective stubs in the check book. This can be done neatly with transparent tape as shown. In this way, the checks and stubs are kept together in the book so that they can be filed away for reference at any time.—J. P. Knipp, Long Beach, Calif.



Novel Display Signs That Attract Customers

Unusual in appearance, these signs are used by enterprising merchants to attract the attention of people passing their stores. The right-hand drawing shows what appears to be a giant frankfurter impaled on the tines of a large fork. This sign is used in the show window of a lunch room, and is merely a large, red toy balloon fastened

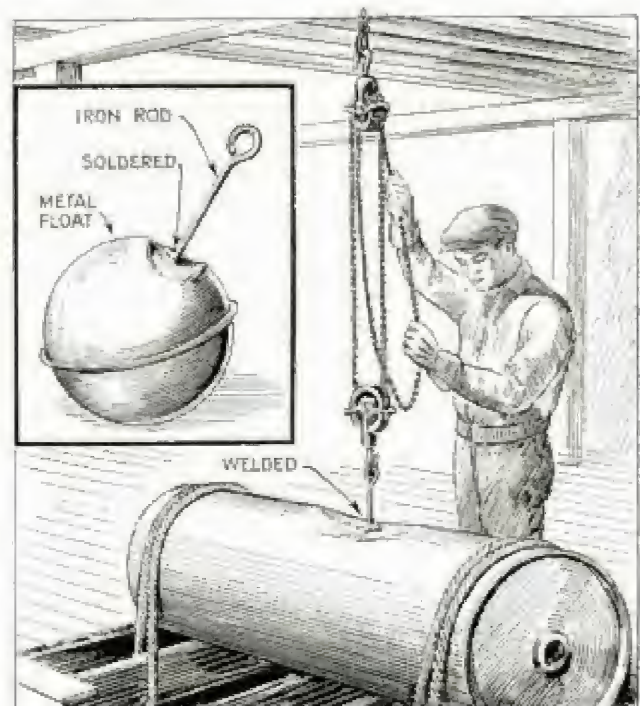


to a fork made of wire. The detail shows how the fork tines are bent to partly encircle the balloon, cement or tape being used to attach the rubber to the wire. Above a bookstore in Cranford, N. J., hangs the giant bookshelf shown in the photo. The books are made of wood which is then carved and painted to make them appear realistic.

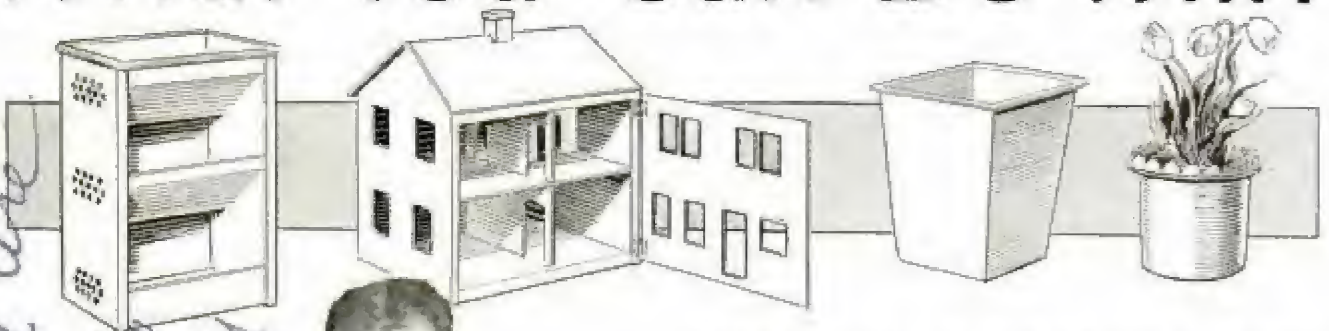
Simple Methods of Removing Dents in Tanks and Boilers

In a repair shop where the mechanics are often called upon to remove dents from tanks, metal floats and boilers, they employ the methods shown. For sheet-metal floats and tanks, a short rod with an eye in the upper end is soldered to the metal where it is dented, after which the dent is removed by pulling on the rod. The latter is then removed by melting the solder with a hot iron. In the case of a boiler, the method is similar. A strong iron rod is welded in the dent, the boiler anchored to the shop floor, after which a block and tackle is used to pull out the dent.

☐ Auto-headlight bulbs will last much longer if the lights are not turned on until the motor has been running for a few moments; when the generator first starts, the voltage is high, after which it drops.



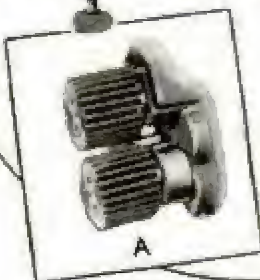
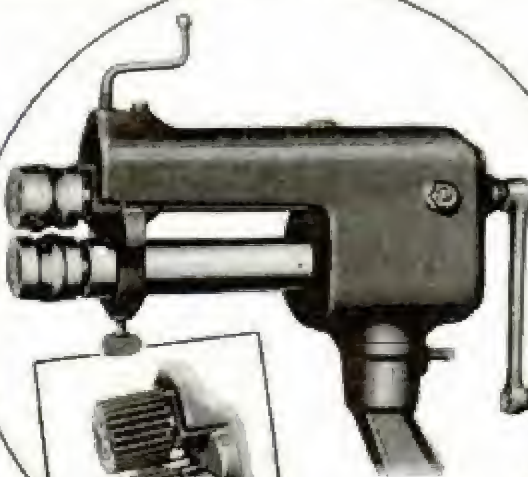
What You Can Do with



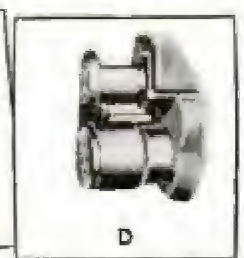
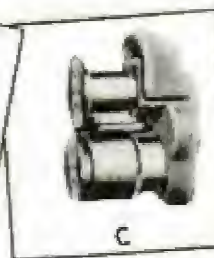
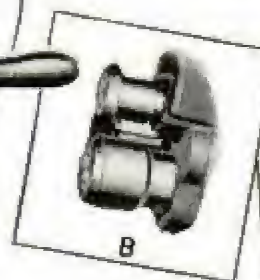
SHEET metal offers the home craftsman a material from which he can make useful articles easily, as well as novelties that can be sold profitably. It is obtained readily in almost any locality, and requires no great outlay in tools; in fact it is handled easily with a few simple ones such as shears, hammers and improvised forming blocks. On the other hand, if you care to go into the work to a greater extent than just making up an article occasionally, there are small compact and inexpensive outfits on the market for home craftsmen. One of these tools is shown in Fig. 1, and includes detachable roller assemblies for various operations in forming sheet metal. The rollers shown on the machine are for beading, while the assemblies A, B, C, and D are for crimping, wiring, turning and burring respectively.

For joining the seams of sheet metal, you can resort to soldering, riveting, machine-screw assembling or spot welding. Of these methods, spot welding is by far the most preferable where water and airtight seams are unnecessary. Spot welding fuses the contacting metal together instantly and is therefore much faster than soldering or riveting. Also, it produces a neat and strong joint. For those who may be interested in building an electric spot welder that will fuse metal up to $\frac{1}{8}$ in. in thickness, complete information was published in the October, 1932, issue of Pop-

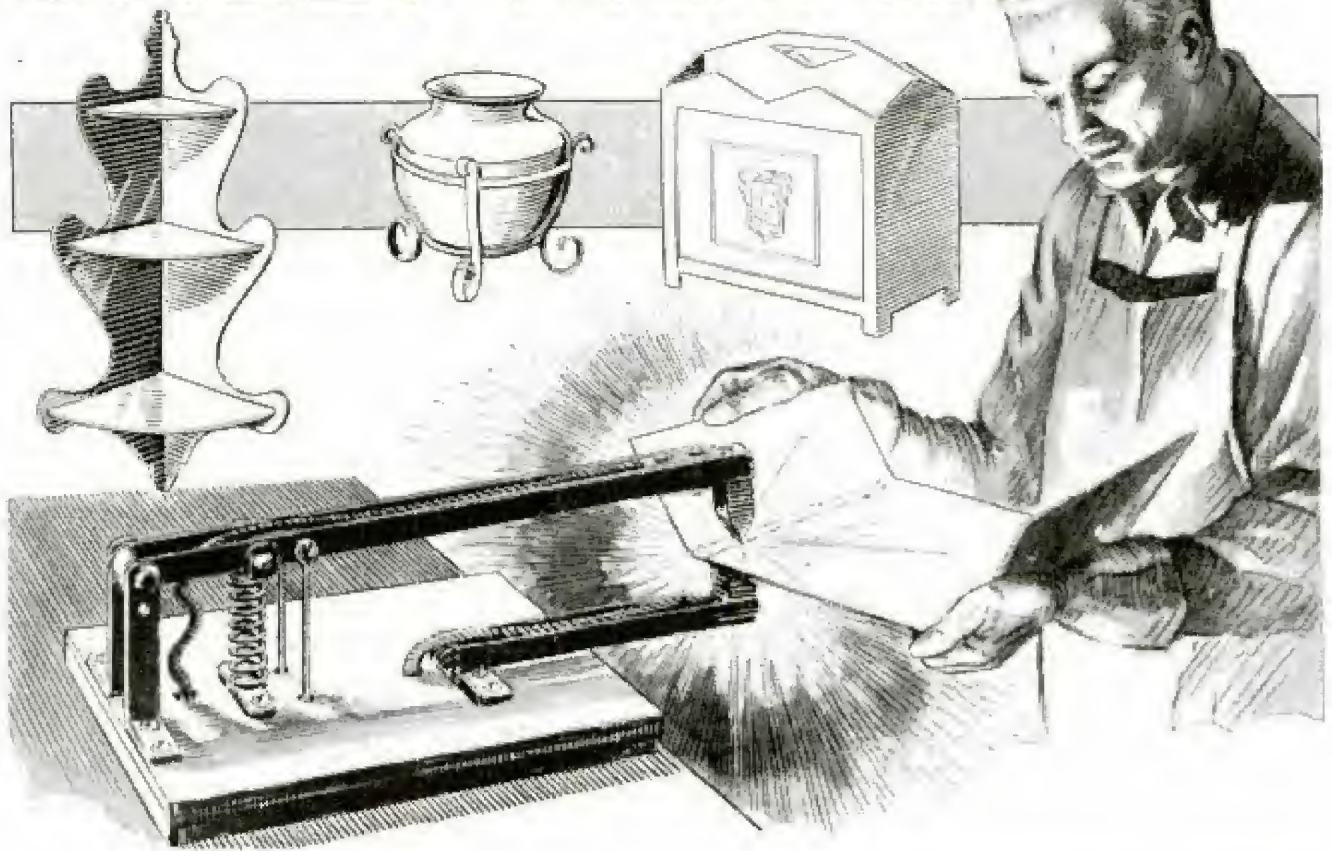
Seams and Joints in Sheet-Metal Work Are Readily Formed with Small, Commercial Outfits, Which Can Be Purchased, and Come Equipped with a Number of Attachments



①



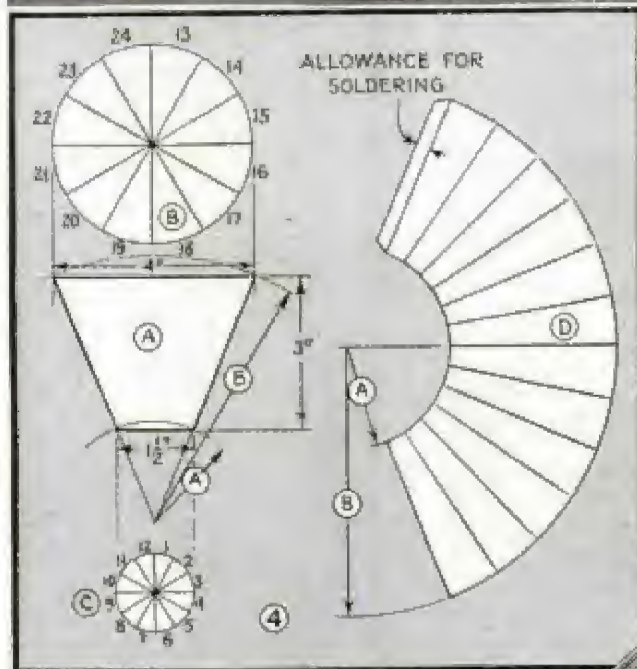
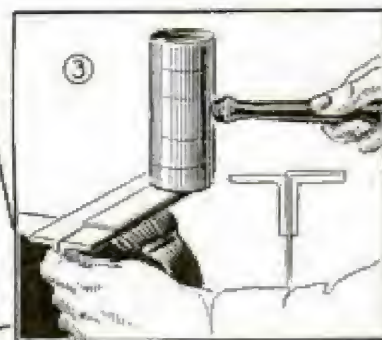
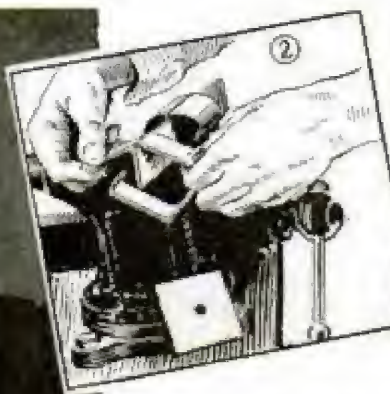
SHEET METAL



ular Mechanics. There are also spot welders on the market that can be had at a reasonable cost.

The first problem in shaping sheet metal is sketching a pattern. Boxes and the like do not present difficulties; however, cone-shaped parts like the sections of a funnel or a reducer to change the size of pipe must be drawn rather carefully. The sketch shown in Fig. 4 illustrates the method of making cone-shaped parts. The same method is used for drawing any round article that is larger at one end than at the other. Sketch A is a side view. The only measurements necessary are the height and the diameters of the large and the small ends. The slanting sides of this view are extended as shown until they meet. The point at which they meet is used as a center from which to set a compass to draw the two semicircles shown at D. Circles where the diameters equal the diameters of the ends of the reducer are next drawn. These circles are divided into 12 equal parts with drawing instruments or with dividers. Starting with the small circle, the dividers are set to the distance be-

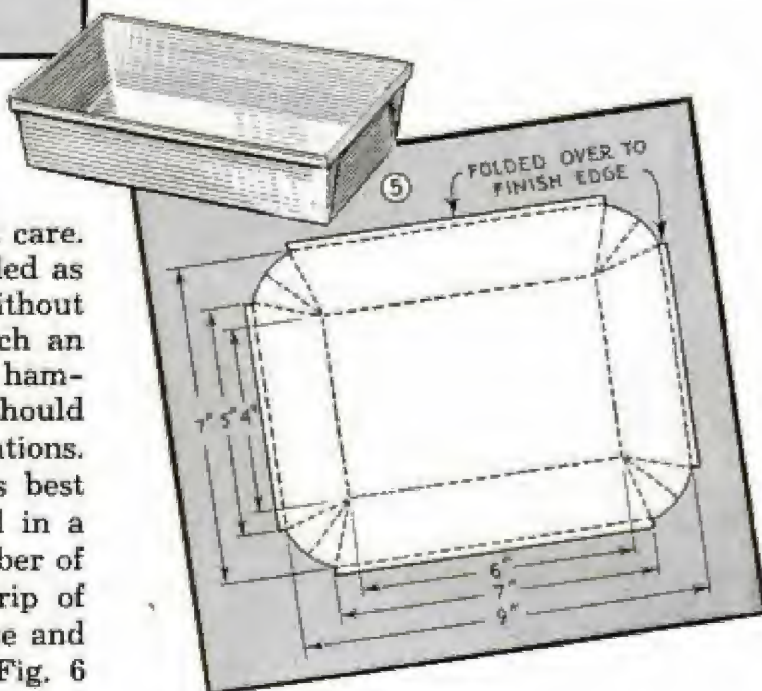
tween the points indicated at 1. With this setting, the dividers are used to step off 12 equal divisions on the small arc in pattern D. Six divisions are stepped off on each side of the center line. The dividers are then set to the larger circle as shown at section 13 of B, and by the same method, the larger semicircle is stepped off. To make this easier to see, lines have been drawn through the pattern connecting all of the points; however, in an actual pattern this is not necessary as the end lines are all that are required. This same method may be used to draw patterns for a large variety of simple items. In Fig. 5 is shown a method of drawing a pattern for a tray or pan made by folding the sides. This method of construction produces containers that do not leak even though they are not soldered. A tray which is to be heated naturally can not be soldered, so this type of construction is the simplest and best available. When the pattern has been drawn it is cut out and laid on the sheet metal and a line is scratched around it. The work is then cut out with a pair of tinner's snips. For irregular shapes and

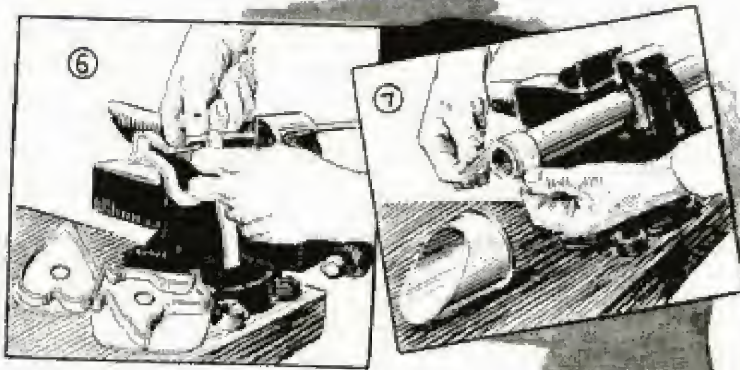


iron rod. For larger bends of the same type, pipe and tubing of various sizes may be used as indicated in Fig. 7. Where the shape and size of the work are such that it cannot be handled in a vise, lengths of angle iron may be clamped to the metal at the point where the bend is to be made and the same result accomplished, Fig. 3.

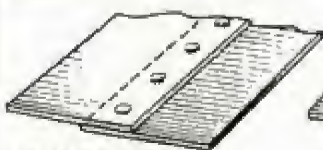
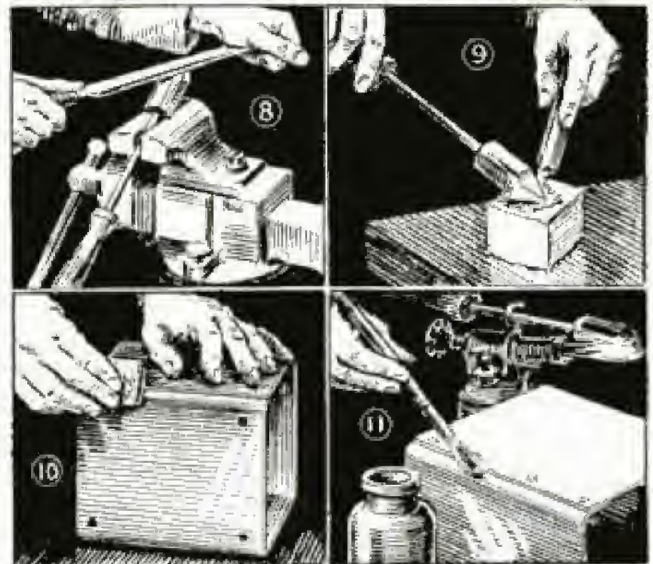
Sheet-metal work is assembled with rivets or by soldering. Fig. 13 shows standard tinner's rivets. If the rivets are used, the holes are made with a hand drill, although a tinner's rivet set may be used if available. The rivet is then pushed through the hole and supported on a vise jaw or iron bar and hammered down. If the rivet is pounded excessively, the metal will be expanded and buckle, thus deforming the work. The forming part of a rivet set is then placed over the rivet to shape a neat head. Various types of joints and seams most commonly used in sheet-metal work are shown in Fig. 12.

curves, hawk-bill snips are more convenient. Bending and forming sheet metal are the only parts of the work which really require great care. Dents in the metal should be avoided as they cannot be hammered out without cupping or dishing the metal to such an extent that it is useless. A rawhide hammer or soft rubber-faced hammer should be used gently for all forming operations. Irregular forming of sheet metal is best done over rods and bars supported in a vise. Figs. 2, 3, 6 and 7 show a number of bends being made. In Fig. 2, a strip of heavy sheet iron is clamped in a vise and used to form sharp bends, while Fig. 6 shows how round bends are made over an

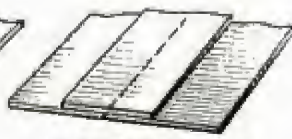




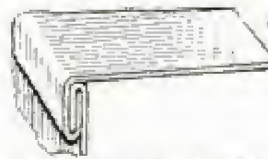
The soldering of sheet metal requires a well-tinned heavy iron. If the iron is dirty or corroded, it should be filed bright and smooth as shown in Fig. 8. It should then be tinned or coated with solder by heating to the temperature at which it will just melt solder freely and then rubbed on a block of sal ammoniac as shown in Fig. 9. In the absence of sal ammoniac, the iron may be tinned by scouring it in a depression made in an ordinary brick with solder and paste. All seams should be cleaned with steel wool or sandpaper, as shown in Fig. 10. The joint is then coated with soldering flux, Fig. 11. For galvanized iron or zinc, straight muriatic acid is used. Powdered rosin is the best flux to use for tin. A lump of sal ammoniac dissolved in water makes an excellent all-around flux. Killed acid, or muriatic acid to which scraps of zinc have been added until it no longer boils, is also excellent for general



LAP SEAM FOR PANS, TRAYS, TUBES, ETC., SOLDERED OR RIVETED



SINGLE BUTT STRAP SEAM, USED WITH HEAVY SHEET METAL



CORNER, DOUBLE LOCK, USED ON SQUARE CANS AND PIPE



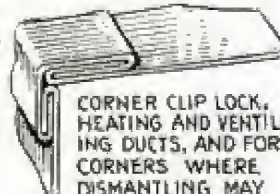
GROOVED FLAT LOCK, USED ON PIPES, FUNNELS, CUPS AND MEASURES



CORNER LAP, USED ON BOXES, TANKS AND DUCTS



FLAT, CLIP-LOCK SEAM, USED ON SQUARE PIPES AND WHERE WORK IS TO BE DISMANTLED



CORNER CLIP LOCK, HEATING AND VENTILATING DUCTS, AND FOR CORNERS WHERE DISMANTLING MAY BE NECESSARY



CORNER FOLD, PANS TO HOLD LIQUIDS OR TO BE HEATED WITHOUT LEAPING AND WITHOUT SOLDERING



DOVETAIL JOINT, USED ON COPPER AND BRASS, JOINT USUALLY BRAZED

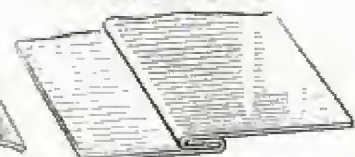


CLINCH LOCK, USED TO GIVE RIGIDITY WITHOUT SOLDERING OR RIVETING

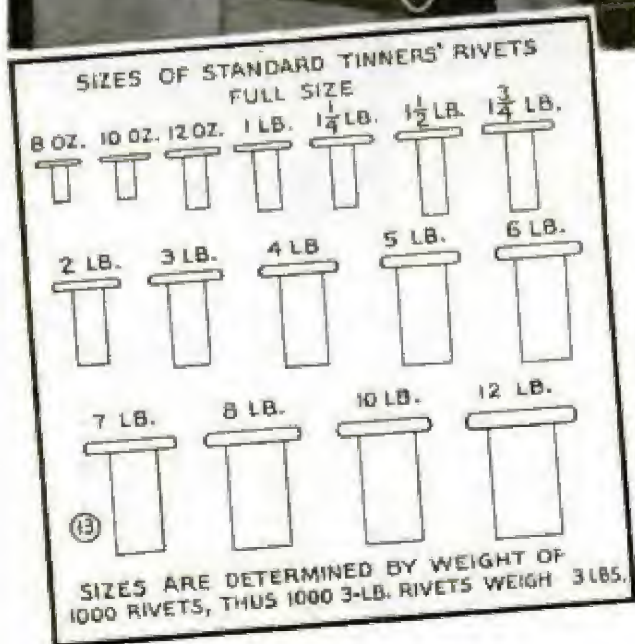
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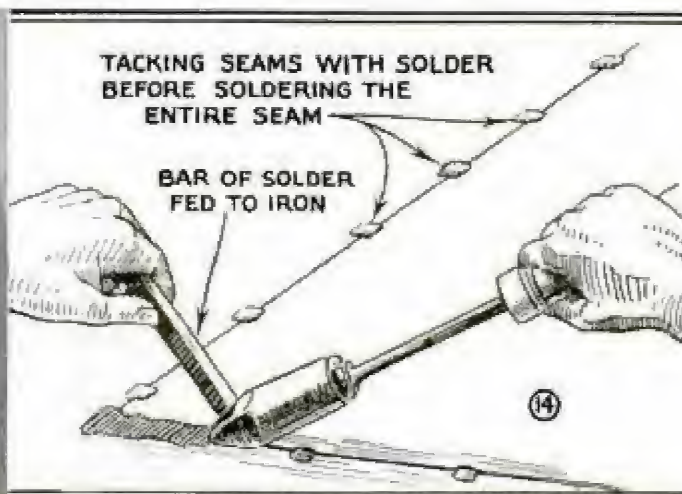
CORRUGATED JOINT, USED IN ROOFING



FLAT LOCK SEAM, SIMPLE BUT EFFECTIVE, LOCK SEAM FOR CANS, CONTAINERS, ETC.



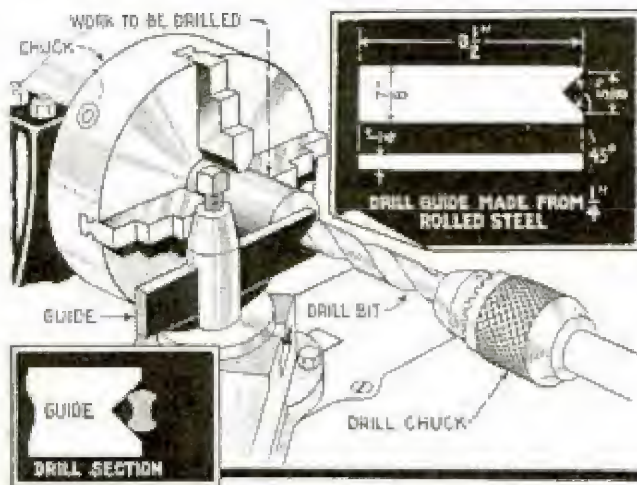
use. Long seams should be tacked with solder in a number of places, as shown in Fig. 14, before any attempt is made to flow the entire joint with solder. After tacking, the hot iron is moved slowly along the seam while feeding solder to it. For this work, it is advisable to use a large, heavy-duty soldering iron capable of maintaining a high heat, as continuous contact of the iron with the metal, when soldering a long seam, will tend to dissipate much of the heat, making a small iron impractical.



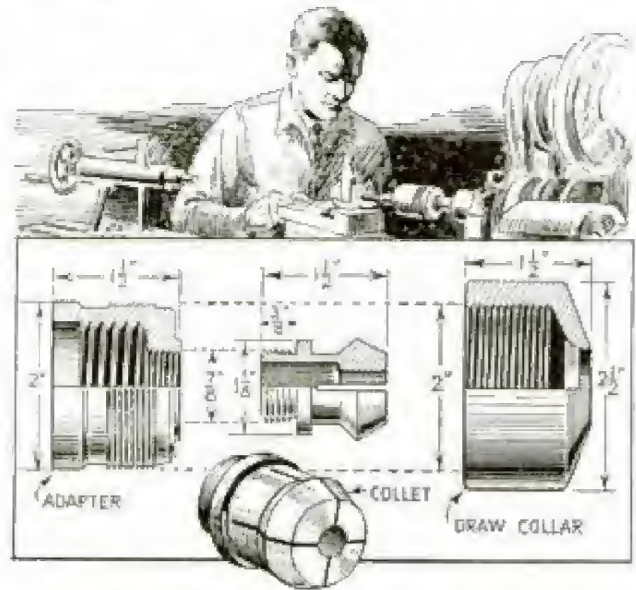
Dyeing Wood in Brilliant Colors

Wood may be dyed by treating it with water solutions of chemicals which cause the development of the dye in the wood. If several colors are to be produced in the same piece, the design is laid out carefully with a pencil and the lines gone over with a sharp knife or chisel to produce slight cuts which prevent the solutions from running together. Two preliminary treating solutions are made as follows: The color-base solution is made by stirring yellow primuline, 1 oz., into boiling water, 6¼ pints. The sensitizing solution is made by dissolving sodium nitrite, .4 oz., and oxalic acid (poison), .6 oz., in water, 6¼ pints. Immediately before use, equal parts of the above solutions are mixed together and applied to the entire surface of the wood to be colored with a brush, and allowed to soak in thoroughly in a dark place. If the wood is quite porous, two or three applications will increase the intensity and depth of the colors. The colors are developed by painting over the dried sensitized surface with developers made as follows: For red, dissolve beta naphthol, .6 oz., and sodium hydroxide, .8 oz., in water, 6¼ pints. For yellow, a 10-per-cent solution of carbolic acid is used, while orange can be had by dissolving resorcin, .6 oz., and sodium hydroxide, .9 oz., in water, 6¼ pints. For purple, alpha naphthylamine, ¾ oz., and oxalic acid, ¾ oz., are dissolved in water, 6¼ pints; for blue, eikonogen, ¾ oz., is dissolved in water, 6¼ pints; and for brown, pyrogalllic acid, ¾ oz., is dissolved in water, 6¼ pints. Distilled water should be used. After the colors have developed, the excess developing solution is washed away and the wood allowed to dry.

Two Ideas That Will Help Lathe Operators



Here is a collet chuck and a drill guide that lathe operators will find handy in their work. The chuck, which is made inexpensively from cold-rolled steel, will take collets of various sizes, and consists of an adapter, collets, and a draw collar to clamp the latter tightly on the work. Note that the collar, which screws over the adapter, is drilled at the outer end and beveled on the inner edge of the hole to fit snugly against the beveled face of the collet. The drill guide, shown at the left, is a



piece of steel to slip in the tool post, and has a V-notch in one end to steady the drill when starting it. In use, the guide is adjusted so that the drill just touches both sides of the notch. Then the lathe is started and the drill fed slowly into the work until it is cutting its full diameter, after which it may be moved back so that it will be out of the way.

Detachable Legs Improve Portable Vise or Pipe Threader

When a pipe threader, vise or similar tool is to be hauled from job to job, weld three short pieces of pipe to the underside of the base as shown. Longer pieces of pipe can then be slipped into these to serve as legs while the tool is being used, and removed when it is being transported. A metal tray welded to the legs below the base braces the assembly and serves as a shelf for small tools.—Jos. C. Coyle, Los Angeles, Calif.

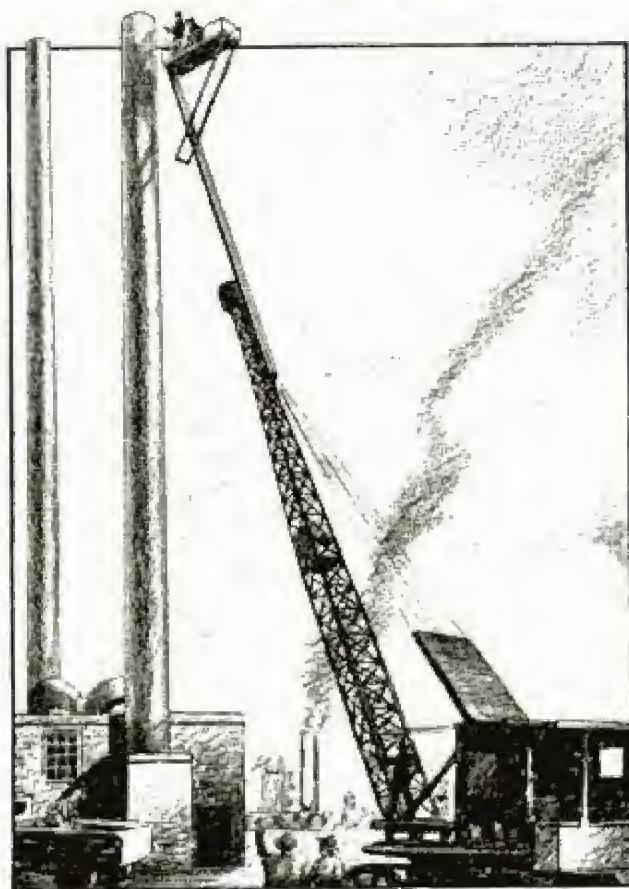
Preventing Waste of Oats in Manger

Many horses have a habit of plunging their noses into a feed box the moment the grain is given them, often thrusting it about so that some of it is thrown over the side of the box. To avoid this, one horseman simply places a brick in the feed box. This does not prevent the horse from eating all the grain, but will effectively curb any tendency to nose the feed over the side onto the floor.



Removable Legs Are Handy on a Vise or Pipe Threader That Is Moved from Job to Job

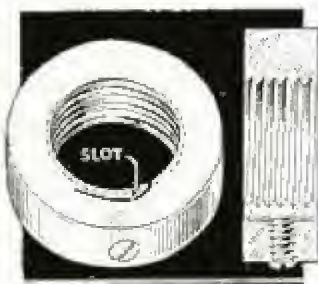
Crane Used Instead of Scaffolds in Painting Smokestacks



Large Tractor Crane Fitted with Platform Utilized to Raise Painters to Top of Tall Smokestacks

To avoid the cost of erecting scaffolds around tall smokestacks that were to be painted, an engineer of a lumber company utilized a large tractor crane to raise the men up to their work. A platform on which the men stood was hinged to one end of two timbers 24 ft. long, the other end of the timbers being bolted to the crane. The platform was leveled from the ground by means of a block and tackle.—M. E. Sanders, San Pedro, Calif.

Efficient Method of Locking Screw Collars

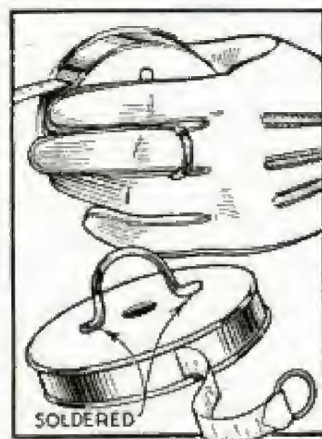


By making a cut in a screw collar with a fine coping saw as shown, it can be locked in place without damaging the thread of the member on which it is screwed. The slot is cut directly under the set screw, and a reasonable distance

below the bottom of the collar threads. A dog-point set screw will have sufficient length to bear on the free end of the threaded section to effect a strong grip.—Clifford W. Morton, Sandusky, Ohio.

Wire Ring Soldered to Case Makes Tapeline Easy to Handle

Workmen who are obliged to use a winding tapeline out of doors in cold weather, find it extremely difficult to hold and wind or unwind the tape while wearing gloves. If the case enclosing the tape reel is of metal, a ring or loop may be soldered to the side opposite the winding crank for the insertion of one gloved finger to hold the case in the palm of the hand as shown.



Bronze Powders Improve Appearance of Painted Signs

An unusual finish for display signs is obtained by dusting bronze powders, which can be obtained from most paint stores, over the lettering while the paint is still tacky. After applying the powder, the surplus is removed easily by tapping the back of the sign with the fingers.

Ivy Vines Prevent Accidents in Factory Yard

After several workmen had been injured by stumbling over guy wires necessarily anchored in a factory yard, one official suggested increasing the visibility of

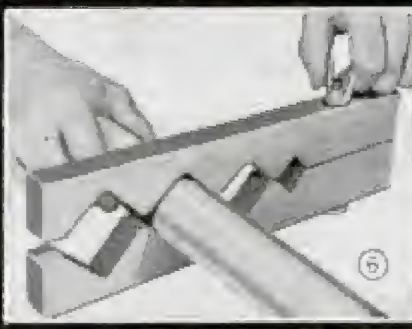
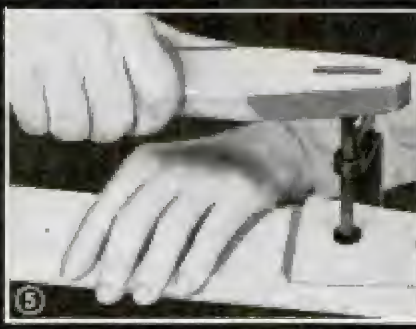
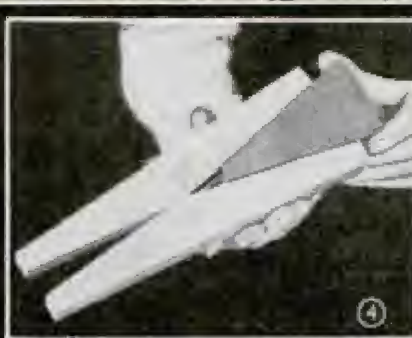
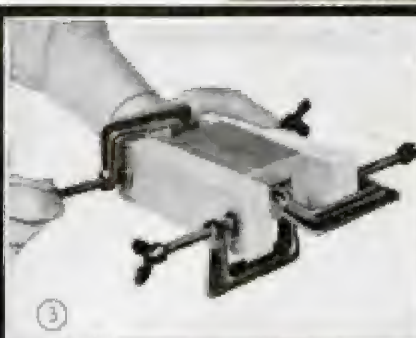
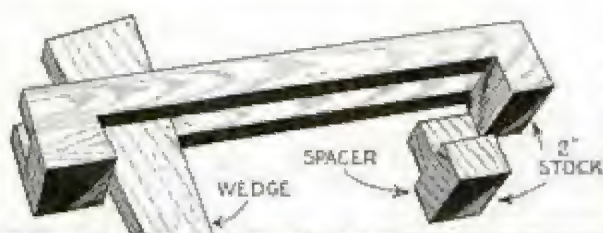


the wires by letting ivy vines grow over them. The vines were planted at each wire anchor, a stake being driven into the ground so that the vines would climb it and then the guy wires.

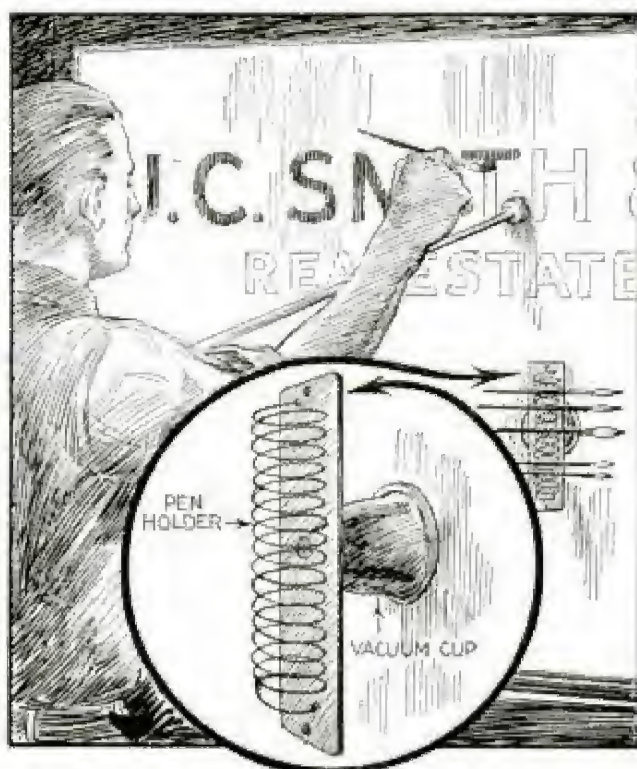
CLAMPING KINKS

for the Craftsman

Fig. 1 pictures a useful clamp of the wedge variety. It can be made from 2-in. stock to almost any length. Spacer blocks permit adjustments. A section of auto tire makes a good clamp for round work, as shown in Fig. 2. C-clamps too short to span the work can often be coupled in pairs, as in Fig. 3. It is usually necessary to have a slight overhang on the supporting pieces when the clamps are used in this manner. The "nipper" clamp, Fig. 4, is useful for small work. The bolt at the center should be a loose fit



Heavy pressure on C-clamps is made possible with the simple handle shown in Fig. 5. The slot should be made large enough to accommodate a wide variety of thumb screws. Fig. 6 shows an excellent clamping device for round stock, the four-point contact holding the work more securely than when simply held in a vise. As with the wedge clamp above it, the bolt must fit loosely. Column or built-up work can be held easily for gluing with the rope clamp shown in Fig. 7. In use, the rope is adjusted to the proper length, and a turn taken about the pin. An ordinary C-clamp furnishes the tension, this being slipped over the two blocks as shown

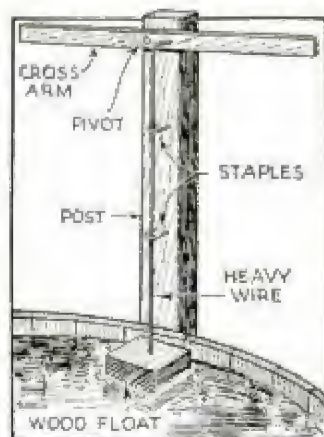


Wire Brush Holder Attached to Window with Rubber Vacuum Cup Saves Time for Sign Writer

Vacuum Cup and Penholder Help Sign Writer

To keep his brushes handy and ready for use when lettering windows, one sign writer attached a rubber vacuum cup to a spring penholder so that it could be pressed against the glass as shown. With this arrangement, it is a simple matter to select the proper brush, and there is no stooping or delay in changing from one brush to another.

Indicator Shows When Water Tank Is Filled



Living some distance from the well at which his stock was watered, one farmer rigged up the indicator shown so that he could tell when the water tank was full without walking out to look at it. The indicator is a wood cross arm pivoted to a post, which is set in the ground to project above the tank. A stiff wire, running through staples in the side

of the post, is fastened to the arm and to a wood float inside the tank, the wire being of such length that the arm is horizontal when the tank is full, and almost vertical when it is empty.—Paul E. Rimbey, Roodhouse, Ill.

Hog Rings Keep Mules from Jumping over Wire Fences

After trying several methods to keep mules from jumping over fences, I put a couple of hog rings in one ear as shown. Two rings are hooked together, and one is fastened in the tip of the ear. As a mule always throws its head forward just before making a jump, the rings rattle, thus distracting attention so that it soon forgets the jumping habit.—R. Osborn, Vermilion, S. D.



Angle-Iron Marker for Cutting Screen Wire

Square, non-raveling ends, which will eliminate waste when cutting screen wire from a roll can be made by first creasing the wire over one edge of a length of angle iron. To mark the line of the cut, press

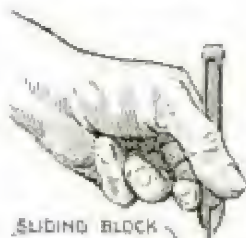


Screen Wire Creased over Edge of Angle Iron Is Cut Readily without Waste

your thumb and forefinger on the wire at the apex of the angle and draw them along the bar, after which the crease can be followed readily with your shears.

❏ Sweet peas should be watered at the roots, as water on the leaves causes them to turn yellow.

Ideas in Repairing YOUR CAR



When grinding off the ends of Ford valve stems to set the tappets, you can check the clearance with this jig without the necessity of removing and replacing the valves in the motor



Zerk grease fittings installed with old Ford valve stem drilled and counterbored at the end



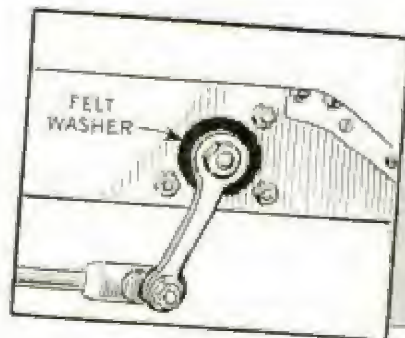
OLD PISTON PIN



Piston pin cut in half and tapered at one end, is handy for removing pins from Ford pistons



When the cam or block on a distributor breaker arm wears so that the points do not break sufficiently, a temporary repair can be made with a strip of friction tape



Above, a felt washer between the frame and steering arm helps to keep dirt from entering steering sector. Right, an altered valve guide, which can be dropped into place from above, will be found a time and labor saver when grinding Ford valves

THIS SECTION OF GUIDE CUT OFF



Hand Soap Dispenser for Mechanics

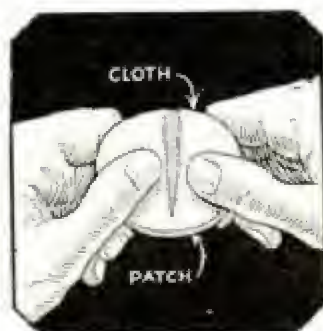


Mechanics' Paste Soap Dispenser Made by Fitting Wood Cylinder into Opened End of Can

Here is a simple dispenser for paste soap, made by utilizing the can in which the soap is purchased. Take the can, cut off one end carefully without destroying the cylindrical shape of the can and turn a wood cylinder to fit snugly inside of it. Then drill a small hole in the other end, and the dispenser is ready for use. It can be set on, or near the wash basin, the soap being dispensed by holding the hand over the hole in the can and pushing down.—Louis Balogh, Jr., Valparaiso, Ind.

Applying Patches to Inner Tubes

Much of the success in patching inner tubes depends on keeping the surface of the tube and patch clean. With the

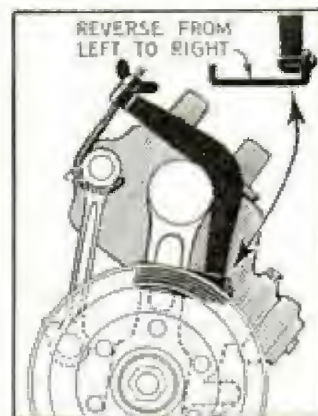


tube, this is comparatively easy, but handling the patch is more difficult. This can be done best by stretching the rubber patch before the glazed cloth facing is removed, thus tearing the cloth into two parts. One part then may be removed, allowing the other part to be used for holding the patch. The lat-

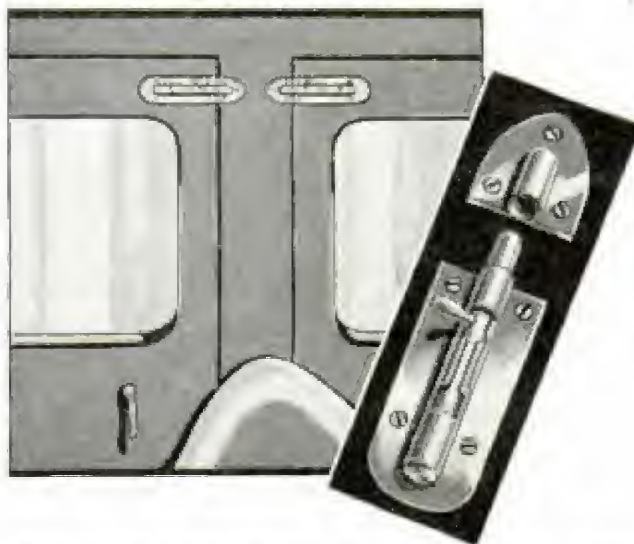
ter is then applied to the tube, after which the remaining cloth is removed and the entire patch pressed in place.

Knee-Action Lock for Pontiac and Chevrolet

Made from a piece of heavy steel, this tool will be found handy for locking the knee-action assemblies on Pontiac and Chevrolet cars to keep them from sagging when the front end is lifted for greasing, changing tires, servicing brakes, etc. The tool is applied as shown, one end being fitted with an iron hook, which is threaded to take a wing nut for adjusting it, while a short bar, bent at right angles at the ends, is pivoted to the other end to fit over the arm carrying the wheel assembly. The pivoted bar can be reversed easily for right and left wheels.



Bolt Locks Used on Car Doors

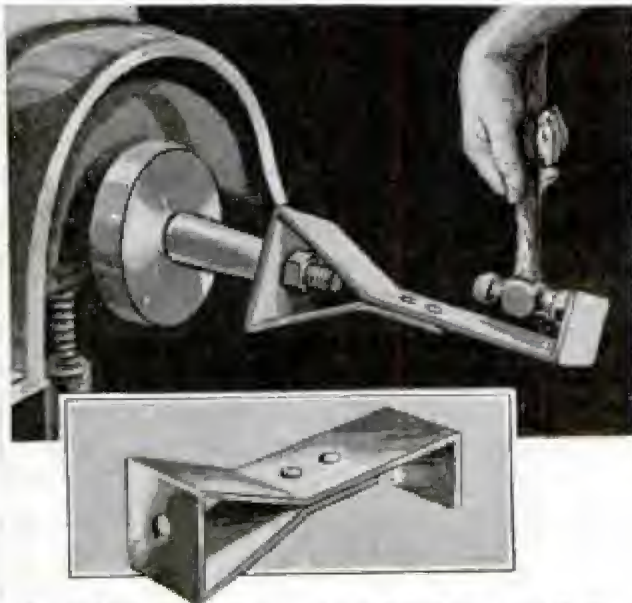


Bolt Locks Keep Children from Accidentally Opening Car Doors While the Machine Is in Motion

To prevent small children from accidentally opening the rear doors of a car while it is in motion, install a small bolt lock on each door as shown. The locks are also an extra safeguard to prevent the doors from being forced open by anyone on the outside.

Tool to Pull Axle Shafts

I have found this tool handy in pulling axle shafts. It is made from a 2-ft. length of $\frac{3}{8}$ -in. cold-rolled steel, which is bent up at right angles at one end, and bent over and riveted as shown at the other end, first drilling the latter to slip over the end of the axle. In use, the tool is slipped over the threaded part of the axle

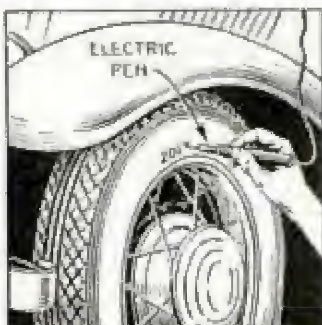


Tool Made from Piece of Cold-Rolled Steel Pulls Axle Shafts of Cars

and the nut driven on to hold it. A few blows with a heavy hammer then will pull the shaft.—James W. Clift, Columbus, O.

Mileage Recorded on Auto Tires with Electric Pencil

One man who wished to know the exact mileage he was getting out of his auto tires, kept an accurate record as follows: When a new tire was put on the car, the speedometer reading at that time was burned lightly in the tire wall near the bead with an electric pencil. Then when the tire was worn out, the figures burned in the tire were subtracted from the figures showing on the speedometer, the result being



the exact number of miles the tire had traveled. When using the pencil, be careful not to burn the tire rubber too deeply.



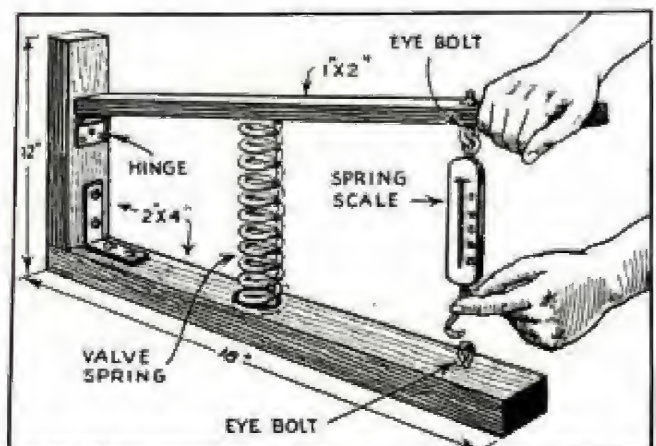
Broken Ring Beveled at One End Provides Scraper for Cleaning Ring Grooves in Piston

Scraper to Remove Carbon in Ring Grooves of Piston

A piece of an old piston ring, with one end filed or ground to a sharp bevel, provides a good tool for scraping carbon out of ring grooves in a piston. The end of the ring may be inserted into a file handle for a hand grip, or it may be wrapped with friction tape.

Improvised Valve-Spring Tester

One of the most important parts of a valve-grinding job is to test the springs for weakness, which causes a sluggish motor. A test for this purpose is made readily as shown. It is, of course, not accu-



Simple Valve-Spring Tester for the Home Mechanic Who Does His Own Valve Grinding

rate to the ounce, but is intended for checking the approximate pressure of one spring against that of another. For better accuracy, you can test one new spring, and use its scale reading as a standard for checking the used ones.



Layers of Asphalt and Fabric Make a Truck Roof That Is Flexible and Waterproof

Truck Roof Covered with Asphalt

Some owners of large truck fleets have substituted asphalt-covered wood roofs on their truck tops for the usual metal or canvas covered ones. The asphalt is easy to apply, repairs can be made quickly and it will last a long time. The truck top is covered first with light roofing boards, after which a thin, priming coat of asphalt is applied to them. Strips of an open-weave fabric are laid over this, followed with a liberal coating of asphalt mixed with asbestos fiber.—A. Maltman, Philadelphia, Pa.

¶If the ignition timing of an auto motor has been disturbed when removing the cylinder head, it is easier to set the timing before replacing the head than it is to do the work afterward.

The Next Issue

RUGGED UTILITY TRAILERS FOR EVERY USE

Typical examples of present-day practice in two-wheel auto trailers—useful vehicles capable of high speed with loads up to 1 ton. Includes boat trailers, farmers' heavy-duty endgate type, as well as light box type for touring.

GRANDFATHER'S CLOCK GOES MODERN

Novel electric-clock cases, including antique cases that were popular in grandfather's day, as well as the modern ship's wheel, banjo, wall and mantel types.

HOMEMADE BALL-BEARING BAND SAW

Auto front-hub assemblies are bolted to plywood wheels and mounted on a frame of pipe and fittings. Saw has tilting table, adjustable blade tension, etc.

DO YOU LIKE TO BUILD MODELS?

Experienced model maker gives you hints on a workbench, the selection of tools needed, and a few simple jigs to eliminate some of the tedious work.

TREASURE ISLAND PLAYSHIP

Fabulous pirate ship, "Hispaniola," of Stevenson's story "Treasure Island," in miniature, makes a play house which is also used for storing garden tools.

COZY CABIN FIREPLACE

A fireplace correctly designed for draft and heating efficiency without sacrificing beauty. Construction simplified so that any amateur can build it.



VACATION DREAMS

come true!

THRILL-PACKED days on the highways — Grand Canyon — Niagara Falls — National Parks — the morning mists of a forest lake, or the silvery brilliance of a desert moon... all the things you've hoped for are at the twist of the throttle when you ride a Harley-Davidson. Yes — vacation dreams can come true — at lowest travel cost.

Own a new 1935 Harley-Davidson! It's so easy to pay for — costs so little to run. There's lasting thrill to its speed, stamina, and high-stepping style. See the new Harley-Davidsons at your dealer's store. Let him give you a free ride — ask about his Easy Pay Plan — and send in the coupon.

VACATION WITH



A HARLEY-DAVIDSON

Ride a
HARLEY-DAVIDSON

MAIL THIS COUPON

Harley-Davidson Motor Co., Dept. P, Milwaukee, Wis.

Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name _____

Address _____

My age is () 16-19 years, () 20-30 years, () 31 years and up, () under 16 years. Check your age group.

UNRULY HAIR

*-Now Neatly
Combed*

**Costs but a few
cents to use—**

IS YOUR HAIR difficult to keep in place? Does it lack natural gloss and lustre?

It is very easy to give your hair that rich, glossy and orderly appearance so essential to well-groomed boys. Just rub a little Glostora through your hair once or twice a week—or after shampooing, and your hair will then stay, each day, just as you comb it.

Glostora softens the hair and makes it pliable. Then, even stubborn hair will stay in place of its own accord.

It gives your hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Glostora also keeps the scalp soft, and the hair healthy by restoring the natural oils from which the hair derives its health, life, gloss and lustre.

A bottle lasts for months

Try it!—See how easy it is to keep your hair combed—any style you like—whether parted on the side, in the center, or brushed straight back.

A bottle of Glostora can be bought for a trifle at any drug store and will last for months.



Glostora
FOR THE HAIR



CATHODE RAY OSCILLOGRAPH IS PORTABLE

(Continued from page 741)

location of the light spot on the screen, is a direct function of the voltage at any particular instant on the deflecting plates. Thus it can be seen that a pattern of light may be traced on the screen by the simultaneous application of voltages to the horizontal and vertical deflecting plates. If this action is repeated 20 or more times per second, the retentive power of the eye is such that the rapid tracing will not be noticed and the entire pattern will be seen, as in television.

Focusing of the light beam on the screen is done by adjusting the voltage on the anode nearest the cathode. The light intensity is controlled by the negative voltage applied to the grid. External voltage under test is always connected to the vertical deflecting plates. A saw-tooth oscillator provides the wave shape, Fig. 2, necessary for moving the beam in a horizontal direction; without this oscillator the beam would only rise and fall vertically.

DOERLE S-W BATTERY RECEIVER FOR BEGINNERS

(Continued from page 745)

condenser, solder a length of insulated hook-up wire to one of the outside stator lugs. This wire is then pushed through the hole indicated. The tuning condenser is now mounted and the dial fastened to the front panel. This set can be operated with 90 volts of B-battery; however, if 135 volts are used as shown in the battery hook-up, Fig. 4, it is a good idea to use an output transformer in conjunction with the phones, or speaker, to protect them.

To tune the set, adjust the filament rheostat to the proper setting and turn the regeneration control to a point where a rushing noise is heard. To receive phone stations turn the knob slightly to the left; this takes away the carrier-wave whistle and clear speech is heard. Further information regarding the set can be obtained from Popular Mechanics radio department upon application, without charge. The antenna-compensating condenser, in the rear of the chassis, should be varied for best results with each coil. In most cases it is closed as much as possible; if too tight the set will not regenerate.

MINIATURE KODAKS FOR SPEED



KODAK DUO SIX-20

The miniature camera that gives a larger picture. In the rain . . . indoors . . . almost anywhere, the crisp, sharp *f*.3.5 lens lets you take pictures. And the Compur shutter gives you speeds up to 1/300 second—fast enough to “stop” an express train.

Just a handful of camera, this miniature Kodak makes sixteen pictures on a roll of 620 film.

And each picture is $1\frac{1}{2} \times 2\frac{1}{4}$ inches, big enough for your album. Complete—Kodak Duo costs \$52.50.



KODAK MINIATURE ENLARGER

With a Kodak Miniature Enlarger to supplement your tiny camera, you can get the full fun out of miniature photography.

Prints of astounding size can be made from little negatives—for instance, a $1\frac{3}{16} \times 1\frac{9}{16}$ -inch negative can be “blown up” to 11×14 inches . . . 100 times the original area.

A paper cabinet base is optional equipment. Price for enlarger, paper holder, Anastigmat *f*.4.5 lens—\$67.50. Paper cabinet base, \$10 extra.

TODAY, miniature cameras are the last word in photography. And no wonder they're so popular. With these small, fast cameras, you're ideally equipped for action pictures, candid photos . . . for all types of snapshots.

A miniature is truly an all-around camera. Small enough to be kept handy, these Kodaks go into action at the touch of a button . . . and their high-speed shutters and lenses give you full control of almost any picture situation.



KODAK RETINA

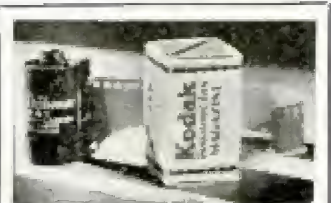
A 36-exposure, precision, miniature Kodak—at half the price of similar cameras

KODAK RETINA—Here's the latest thing in miniature cameras. You'll find all the most desirable features incorporated in this tiny Kodak—yet it costs about half as much as other cameras of similar range.

Its Compur shutter has *extra* speed—up to 1/500 second . . . and a brilliant *f*.3.5 lens admits ample light for fast exposures—or lets you make “candid” pictures in

artificial light. Kodak Retina is a high-precision camera with a low film cost per picture . . . gives you 36 exposures (24×36 mm.) on each roll of film.

A film-winding device automatically counts the pictures you make—prevents overlapping, no wasted film is possible. Complete, with optical finder, depth-of-focus scale, plunger-type shutter release—the Retina costs but \$57.50.



The Retina uses either high-speed Kodak “SS” Film or fine-grain Kodak Panatomic Film. Both come in daylight-loading magazines. Easy loading is one of the prime features of the Retina. Just lift the hinge back and you can load this tiny camera as simply as a Brownie.



FREE! a valuable folder—and a handbook on enlarging

New folder covers miniature Kodaks, enlarger and films. 38-page booklet gives data on enlarging, bromide papers, development formulas. Eastman Kodak Co., Rochester, N. Y.

Name _____

Address _____

City _____ State _____

P. M. 6-85

FAKE STAMPS

(Continued from page 719)

paper or a gum not in use at that time."

Hard to detect is the work of those who specialize in repairing damaged stamps. In joining pieces of stamps together one faker thinned down the edges delicately and glued them together with an insoluble cement. Usually, however, the joint is slightly thicker than the rest of the paper. Another trick, if a stamp cut from a sheet is worth more than one with perforated edges, is to trim off the perforations and paste on unperforated paper.

Recently Mr. Poole was asked to determine whether the inverted center of an early American stamp was faked. Under the microscope he could not find a flaw. In benzine, the watermarks were found genuine, but near the center of the stamp was the thin shading of a watermark which branded the stamp as fraudulent. The inverted center had been faked by scraping down the center of the original stamp, then scraping the sides and back from another center and carefully cementing it upside down in place. Sometimes an inverted center is manufactured by scraping off the original design, sensitizing the paper and photographing a new one.

By accident a few sheets of the Mexican twelve-centavo stamp of 1868 were printed in buff instead of regular green. The green stamps are valued at twenty-five cents but the buff catalogue at fifty dollars. Experts sometimes find a faker has removed the green dye from the cheaper stamp with chemicals and dyed it buff, a fraud disclosed under ultraviolet light.

"Most forged stamps are crude lithographs," Mr. Poole says, "but others are beautiful specimens of engraving. But the forger makes some tiny mistake.

"Only one case is known where the most rigorous study reveals no difference between a counterfeit and a genuine stamp. English postal employes fraudulently surcharged the letters 'I. R.' over the faces of some stamps issued in 1902, in imitation of a few that had been issued. The untouched stamps are worth \$450 each and the surcharge increases their value to \$2,000 a stamp. But since the forgers used the same ink and type, there is no way to tell the real from the apparent. The owner of a genuine surcharge can be certain of its worth by getting the stamp's pedigree."

No counterfeiter has dared copy the most valuable stamp in the world, the black and magenta British Guiana one-cent of 1856, of which only one copy, worth about \$50,000, is known to exist. Unless a forger should find another of the originals to copy his imitation would be very obvious, and if he should find an original it would be worth too much to copy, as an undetected forgery would depreciate the value of the original by decreasing its rarity.

Forgers often attempt to raise the value of a specimen by faking a watermark by thinning down part of the paper or by tracing in the watermark with oil. Some early stamps were grilled like modern checks to prevent erasure of the cancellations, and fakers often imitate the grills. Counterfeits of surcharges that may triple the value of a stamp are detected by minute differences in the spacings between the letters, or by irregularities in the original type not copied in the imitations.

In the case of a Romagna stamp issued in 1859 the new ones catalogue at \$3.50 while the used ones are worth \$300 each. The reason is that while a great number were printed, they were withdrawn before many were used. Some have tried to place cancellations on their new Romagna stamps to jump their value but experts can tell the imitations at once. Few imitators know what sort of cancellation was used, and those who do know find trouble in mixing the right sort of ink.

Now and then collectors place a higher value on a counterfeit than on an original, usually because the counterfeits were accepted by a government as real and were cancelled in good faith. Fake stamps known as the "Chicago counterfeits" that passed government inspection in this country in 1890 are worth 100 times as much as the real stamps.

Sometimes a forger manufactures stamps out of his imagination and creates pretty pieces of paper that bear a name and a date but really were never issued by a government. These "phantom" stamps rarely fool anyone except a tyro collector.

"One way to determine whether a valuable stamp is genuine is to compare it with a copy known to be original," says L. Bissel, another collector. "Collectors also should beware of reprints, stamps struck off the original dies but issued on different paper for exhibition purposes."

CLEAN *shaves* are COOL *shaves* now!



Once-over . . . twice-over . . . even two shaves a day . . . yet no burning, no rawness, no call for lotion. Not when you use Ingram's, the cream that makes shaves *cool*!

Ingram's Shaving Cream has in it three special ingredients to tone the skin, soothe it, save it from irritation. Jabs and stings are *out*—instead, you enjoy a bracing coolness that lasts all through the shave, and for hours after.

Get away from rough, hot shaves. Try them clean and cool. Ask your druggist for Ingram's—and when you use it, notice how little you need for a foamy, wilting lather. That's why Ingram's shaves are so economical!



INGRAM'S SHAVING CREAM

Try the world's coolest shave

BRISTOL-MYERS CO., Dept. E-55,
110 Washington St., New York, N. Y.
I'd give cool shaves a warm welcome.
Send me a 10-shave tube of Ingram's, free.



Name _____

Street _____

City _____ State _____

ROUGH RIDERS OF THE DIRT TRACK

(Continued from Coloroto Section)

Fast thinking is another thing that wins on dirt. Conditions change from second to second. After a few laps the cars begin to cut up the course, the tires sweeping dirt out of holes that may become a foot deep before the race is half over. Even the brick Indianapolis speedway has its hills and hollows, varying on hot days. To spectators the turns look like easy curves, but at 100 miles an hour perfect judgment in handling the wheel and throttle is necessary to stay on the course.

These are some of the reasons why nearly all good racing drivers are surprisingly young. Even at Indianapolis where the comparative veterans gather, the average age of all drivers is around twenty-eight.

American race cars can make faster speeds than are safe on any track and the dream of drivers is a speedway engineered to permit driving up to 150 miles an hour. Indianapolis was designed for speeds of about ninety miles an hour, but even on rough dirt tracks these days drivers take the straightaways at 120 miles an hour.

In winning the Indianapolis race, Cummings actually reduced his speed several times to assure winning. He had estimated he needed to average 109 miles an hour, not including pit stops, to win. Whenever he was clocked going faster, his pit crew signaled him to slow down. To go faster than necessary might have jeopardized his chances of finishing. So carefully was his speed controlled that he finished within six seconds of the time planned.

In the coming Indianapolis race the drivers will be limited to forty-two and one-half gallons of gasoline for the 500 miles and each car will be allowed six gallons of oil, the same as last year. Cummings won in 1934 with eight and a half gallons of fuel to spare. Accordingly, this year, he plans few changes aside from lightening the crankshaft of his engine, a ten-year old four-cylinder Miller marine motor.

Streamline bodies may stage a comeback this year because they may offer better fuel economy and still permit good speeds for cars with high fuel consumption. Drastic streamlining gives a free wheeling effect that necessitates frequent use of the brakes. This year, with better brakes, the drivers expect less trouble in slowing down for the turns.

ONE-TUBE BELT RECEIVER FOR PEDESTRIANS

(Continued from page 743)

is placed in series with the A-battery to reduce the voltage from 3 to 2 volts for the filament of the tube. It will be noted that the switch, placed in the upper edge of the box between the volume control and tuning knobs, opens both the A and B-battery circuits to prevent any possibility of drain on the batteries when the set is not in use. The tuning condenser is a Hammarlund dual midget-type 140 mmfd. with the two sections connected in parallel.

The wooden case used in the original model was a small sewing box purchased in a department store. However, a cigar box of the same dimensions could be used if desired. With the lid closed, the outside measurements are as follows: $7\frac{3}{16}$ in. wide, $5\frac{7}{8}$ in. deep and $2\frac{5}{8}$ in. thick. This box is constructed from $\frac{3}{16}$ -in. wood stock decorated with Japanese lacquer. All of the controls are mounted in the upper edge so that the set can be tuned when fastened on the belt. Two pieces of scrap metal are bent to form the belt loops, which are screwed to the back of the box; a complete material list may be obtained upon application without charge.

All parts are available from any radio supply store with the exception of the tuning coil, which anyone can wind easily in a few minutes. It is wound on a piece of bakelite tubing $1\frac{1}{4}$ in. outside diameter and $2\frac{1}{4}$ in. long. The antenna-coupling coil, L₁, consists of 12 turns of No. 30 enameled wire; the grid coil, L₂, is wound with 90 turns of the same size wire, spaced $\frac{1}{4}$ in. from L₁. A tickler coil, L₃, which causes regeneration and greatly increases the range and power of the receiver, consists of 40 turns of No. 30 single-silk covered wire, random wound on a 1-in. spool which is pushed inside the other coil. The completed coil assembly is mounted by means of two $\frac{5}{8}$ -in. fiber bushings and machine screws. An enlarged blueprint of the layout and wiring diagrams is available; those who wish it should specify blueprint R-209.

When the set is placed in operation, with the batteries connected as indicated in Fig. 2, the tickler coil should be tried at different points inside the other coil until the best results are obtained. It can be held in position then with a wooden wedge.

Here is where
PENNSYLVANIA
MOTOR OILS
save you money

**AND HERE IS
 WHERE THEY
 COME FROM!**



THE vitals of your motor—such as the piston in the picture—are where Pennsylvania motor oils prove their worth. In the unseen inside of your motor they give better protection against heat, friction, sludge. They prevent wear. They save repairs . . . cut costs.

Look at the map! The area shown there is the only place in the world where Nature stored her finest lubricant—Pennsylvania Grade Crude. From this special crude are refined all the motor oils sold under the insignia of the Pennsylvania Grade Crude Oil Association. They are *better oils from the ground up*. They bring you big savings, not only on repair bills, but directly on gasoline and oil.

“New oils” made by new processes are often offered to you—claiming to be “equal to Pennsylvania.” Of course the art of refining motor oils is constantly being improved. But any process, to produce the finest result, must employ the best raw material. No matter what method or treatment the refiner uses, he gets a better finished motor oil from Pennsylvania Grade Crude. That’s why more and more motorists insist on these *genuine* Pennsylvania oils!

Next time you need oil—buy an emblem-protected Pennsylvania motor oil! It will save money for you.

Pennsylvania Grade Crude Oil Association, Oil City, Pa.

Copyright 1935, Pennsylvania Grade Crude Oil Assn.

What This Emblem Means!

This emblem is the badge of membership in the Pennsylvania Grade Crude Oil Association. It is neither a brand, nor a pledge of equal quality among the brands using it.

You are protected when you buy oils sold under this emblem, because it assures you that (a) they are made 100% from Pennsylvania Grade Crude, (b) they meet or exceed the high minimum standards assuring proper lubrication of modern motors.

Safeguarding these assurances are (1) the research laboratory of the Association, (2) a national field force, and (3) each member's surety bond.



BETTER OILS FROM THE GROUND UP!

When writing to advertisers please mention Popular Mechanics

6-74

SIGN TALK SPEEDS RADIO DRAMA

(Continued from page 704)

against the open door before it slams. I can hear the last faint echo of a canary's chirp, and thus I am able to give an actor his cue at the proper time. Without properly timed cues no radio performance can succeed, for an audience scattered all over the country is easily displeased by something out of time. Just as you need a proper interval between words in your speech, so you need that interval between sounds.

"One of the most difficult stunts in radio is to reproduce the shriek of a woman falling from a great height. The radio director must give this feat the proper atmosphere and timing. We tell the audience that she is falling fast by making the voice rise in crescendo and then recede with an agonized shriek. The effect is hair-raising.

"A radio director must be more than a director. He must be liked and have the confidence of those who work under him, and he must be able to command their emotions. In the quiet of a studio, an actor often finds difficulty in getting rhythm into his speech—it sounds 'lily.' I immediately sense it, and I begin to sway my body slowly from side to side, and almost unconsciously he falls into the proper mood and rhythm."

When the deaf-and-dumb language fails, Mr. Hanna uses psychology. Above all, he strives to keep the musicians and actors in the proper mood and spirit. He was the first director to have a broadcasting studio illuminated with lights which make bright spots around the microphones and leave the rest of the studio in semi-darkness.

"This atmosphere," he says, "is not for the radio audience or for studio visitors. It is for the people with whom I am working. From the highest-paid artist to the humblest extra, they are affected by these lights, which convert the studio into a stage and let them forget they are in a suspended sound box."

Mr. Hanna impresses his players with the idea that a microphone is like a hot poker and ought not to be approached.

"In fact," he said, "I am now preaching that there is no microphone in the studio—we must forget its very existence in order to make programs sound natural. In the early days of broadcasting, it was the custom for radio performers to hug the carbon 'mike.' When the condenser 'mike'

came along, they stood at a distance of several inches. The dynamic 'mike' allowed them to stand off a little more. And the ribbon 'mike,' now in use, allows them to stand almost anywhere within ten feet, except in front of the narrow 'dead' sides. But the crystal 'mike' will enable one to stand any place in the studio, for it has no dead side.

"Modern broadcasting technique is leading toward one thing—television. And that is why, in the immediate future, I intend to remove every vestige of a microphone from a studio. A new type of parabolic 'mike' will hang from the ceiling like a chandelier. All sounds within a twenty-five-foot circle beneath the parabolic surface will be projected up to a concealed microphone, in the center of the device.

"When this development materializes—and I anticipate that it will come very soon—performers will have nothing more to do with a microphone. The studio will be set like a real stage, omitting only the curtain."

After the microphone disappears from the studio floor, Mr. Hanna said, an attempt may be made to give three dimensions to radio sound instead of broadcasting a little more than one dimension.

This means the art of giving sound the proper perspective. And this is accomplished by an ingenious arrangement of microphones which are attuned to given and pre-determined sound frequencies.

"It may seem strange," said Mr. Hanna, "but you are getting about two per cent of the proper sound perspective through your home receiver. But with our present knowledge, it is already possible to deliver seventy-five per cent of sound perspective.

"If, for instance, you want to broadcast a revolver shot, it cannot be done properly by merely firing a gun in front of a microphone. But by the proper distribution of special microphones, you can catch the actual click of the trigger, the bang of the explosion, the reverberation of the sound, the sound of the bullet as it flies past your ear, then the receding whistle, the hum, and the dull thud against the target. That's what a pistol shot should sound like over the radio, and that is what we are striving to get. I fully expect that three-dimension broadcasting, that is breadth, width, and height, will soon become part of our standard studio technique. The effect of such dimensional sounds on the human ear is startling."

Some men are older than they look

HERE'S HOW TO LOOK YOUNGER THAN YOU ARE



"HI BABE!"

LOOK in the mirror. See how those wrinkles and age lines are etching themselves in your face.

If you lived in the tropics there might be some excuse for premature old age showing on your face.

The broiling sun soon dries up the natural skin oils and makes men and women look old before their time.

Shaving with alkaline soaps dries out the skin in much the same way.

That's why you see so many wizened-up old young men everywhere about you.

If you want to keep looking young and fit, throw away the old shaving brush and buy a tube of Barbasol.

Start shaving tomorrow with this modern latherless Barbasol that makes a pleasure out of the daily chore of removing whiskers.

The bland oils in Barbasol leave your face in the pink of condition. It's so soothing that many people use it for sunburn, windburn and chapping.

You'll look younger if you shave with Barbasol.

Tune in Edwin C. Hill every Wednesday evening over the Columbia Broadcasting System Coast-to-Coast, and Singin' Sam—the Barbasol Man—every Friday evening over WOR, WLW and WGN. (See your newspaper for local time.)



Try Barbasol's new razor blades—scalpel-sharp, 5 for 15¢

NOTHING STOPS A MINER

(Continued from page 661)

ing in the past have been heat, pressure and cost. Sinking a shaft a mile or more deep is necessarily expensive, and the terrific pressures far beneath the surface are a hazard, but heat has always been the biggest problem where deep mining would otherwise be profitable.

After descending the first 500 feet where conditions are affected by atmospheric temperatures, deep mining becomes mostly a battle to dissipate heat. After the first 500 feet, the temperature in a mine increases by an average of one degree for each eighty feet of descent. If temperature at the 500-foot level is seventy degrees, a shaft 3,000 feet deep is likely to have a temperature of about 100 degrees.

And mines of such depth are by no means uncommon. A copper mine in Michigan boasts a vertical shaft a mile deep, a gold mine in South Africa is down 8,000 feet and one in Brazil which has been producing gold for 100 years is 8,600 feet deep—nearly a mile and one-half. But high temperatures sometimes are encountered at comparatively shallow depths. Rock temperatures at the bottom of a 2,800-foot copper mine in Arizona range from 104 to 116 degrees, and water gushing out of the ground at similar depths is 112 degrees.

There are several causes for this heat in deep mines, including the natural heat of the interior of the earth and of hot waters rising from great depths. Add to these the natural body temperatures of workers, the heat from powder explosions and compressed-air lines and even from miners' lamps, and a condition is created where it is impossible for men to work.

Four methods of heat control have been developed. For comparatively shallow mines, the air released in drilling operations may moderate the temperature sufficiently. Fans circulating air rapidly are employed in some mines and in others a water spray is used, but this last system increases humidity. The fourth and most modern method, and the one which must be employed for very deep mining, involves the installation of a refrigerating plant using a non-poisonous gas. The aim of all these systems is to maintain a temperature in the mine shaft not higher than eighty-five degrees. This has been accomplished in shafts more than 8,000 feet deep.

When temperatures can be controlled at 10,000 or even 15,000 feet, we may expect to hear of mines two and three miles deep.

Successful mining probably requires more individual initiative than almost any other industry because hardly any two problems the miner encounters are identical. In Texas an attempt was made to sink shafts in a salt mine. It was intended to drill parallel holes, and flood one with steam or boiling water to force the salt out the other. But the steam and water dissolved the salt and the walls caved in. The problem was solved by spraying the walls with gunite, a combination of sand and cement, sealing off the air and water.

The development of electrified mining, dragline dredging, mechanical handling of ore and improved methods of recovery has made profitable large scale operations on ground where the miner using crude hand methods cannot make a living, but the little fellow out on his own hook exercises more ingenuity and downright inventive genius in his mining than the biggest and most efficient mining company.

The lone hand uses clever makeshifts of his own construction and thereby turns low-grade ore into pay dirt. One miner owned very little besides an old car. Finally it broke down. So he used the engine to operate his hoist, pump and concentrating table and now is doing single-handed the work of several men and making it pay. Another man constructed a water wheel to run a jig in mining tungsten ore, and others have utilized the free water power furnished by some small mountain stream to do laborious tasks for them.

Nor is there any hazard or danger too risky for the prospector, once he gets the idea that he knows where pay dirt is. One grizzled sourdough, almost seventy years old, has a claim on the open face of a precipitous cliff in Colorado. To reach his diggings, he must climb 1,000 feet straight up a sheer wall of rock, or must use a circuitous route to reach the top of the mountain and clamber 1,000 feet straight down. No one knows which route the old miner uses. But his tunnel can be seen and so can he on the rare occasions when he emerges from it. Through some process of reasoning or prospecting, he decided there was gold in the side of the mountain. So he went up there—or down there—and started digging. Nothing can stop a miner.

An Announcement 3,000,000 MOTORISTS HAVE WANTED TO HEAR

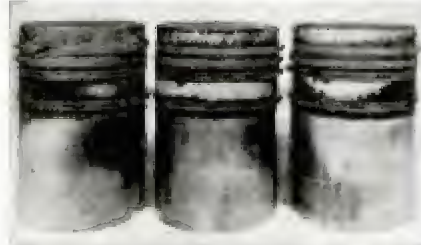
**Today all Summer grades of
Mobiloil are made by
Clearsol Process**

THIS ANNOUNCEMENT will have a vital effect on America's motoring bill. For it brings news of a new Summer Mobiloil made by the same Socony-Vacuum Clearsol Process that produced the new Mobiloil Arctic last winter.

Tests show the amazing improvement this new process makes in Mobiloil. Compared with another leading oil, Mobiloil showed 98% resistance to consumption; the other oil 88%. Mobiloil registered 100% resistance to gumming; the second oil 68%. In a test for thinning, Mobiloil came out 100 *plus*; the competing oil 38!

There's no increase in price for this new Summer Mobiloil. Try it!

SOCONY-VACUUM OIL COMPANY, INC.



100 hours on ordinary oil stuck rings with gum — formed by impurities left in the oil.



100 hours on new Mobiloil left rings clean. This new kind of oil is practically 100% pure.

75,000 dealers now ready with this new Summer Mobiloil. Grades A, AF, B and BB...for all cars.


Mobiloil

MADE BY THE FAMOUS CLEAROSOL PROCESS



Free

THE YEAR'S FINEST HOME WORKSHOP BOOK



CASCO PROJECT BOOK

28 Prize Winning WOOD WORKING PROJECTS

BUILD THEM IN YOUR OWN WORKSHOP

BUILD THEM IN YOUR OWN WORKSHOP

Recently the manufacturers of CASCO Waterproof Glue made cash awards to the 28 homecraftsmen who submitted the best woodworking projects built with CASCO Glue during 1934.

These prize-winning articles have been assembled in the form of a most interesting and instructive book containing photographs and descriptions of these outstanding woodworking projects...inlaid card and game table, model hollow hull sailboat, unique tilt table made from cigar box wood, modern beverage set, beautifully patterned wood turned vases, lamps, smoking sets, cigarette boxes — and many others ranging from delicate wood jewelry to portable camp refrigerators.

The object of this book is to guide the homecrafter in the utilization of inexpensive pieces of wood and veneer, to build with the help of CASCO Glue, beautiful and durable articles of permanent value.

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Interchangeable type is a feature of a new German typewriter. If a change in style of writing is desired, one set of type can be removed easily and another installed, making the one machine serve the purpose of two typewriters with different styles of type.

FILM GIVEN THIRD DIMENSION BY COLORED SPECTACLES

Three-dimension motion pictures have been demonstrated in France recently. Using the principle of the stereoscope, two pictures taken at different angles are superimposed on the screen to be viewed through colored spectacles. This principle has been employed before, but unsuccessfully because the spectacles fatigued the eyes and caused blurring. The inventor of the new three-dimension movies found that the colors of the lenses were to blame. Accordingly, he has produced a pair of spectacles containing one bluish lens and one yellowish lens. One allows the passage of green, red, violet, indigo and blue rays and the other passes green, yellow, orange and red, the two forming a solar spectrum that gives a natural white to produce a clear picture appearing to have depth. Through the spectacles, the pictures appear so natural that the effect is startling.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

Dr. W. Louis Dean



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TRAINING YOUNG SEA DOGS

(Continued from page 677)

duties and to make hourly patrols of the whole ship as part of the fire-prevention routine. He goes off duty again some time before midnight.

During his first year a cadet is made responsible for the upkeep and maintenance of a lifeboat and as soon as he is qualified he takes an examination for a certificate of competency as a lifeboat man. At the end of the year he applies for an able seaman's certificate, for which he also is examined.

After that his training as an officer begins. He usually stands watches with the regular officers and learns to use all the equipment and aids to navigation on the bridge. Also, during his second year, he is taught navigation by the officers, including different methods of determining a ship's position at sea, rules of the road, and signaling. He learns to obtain a "fix" with the sextant, how to read charts, and how to take bearings.

During his third year he usually is competent enough to be placed in charge of seamen and to perform any of the multitude tasks in the deck department, although, since his status is still unofficial, he remains under the eyes of the officers. Finally he is qualified to take the third mate's examination given by the board of supervising inspectors of the steamboat inspection service, in which he must show an intimate practical and theoretical knowledge of fifteen different subjects, such as obtaining longitude by the chronometer, deviation of the compass by tables, and middle latitude sailing. Not only must he prove his ability to navigate a ship, but also his proficiency in such subjects as methods of stowing different kinds of cargo and the ways used to fight fires at sea.

Most steamship companies receive many more applications for cadetships than there are places. Some who received appointments in the past had no real intention of remaining at sea and made two or three trips merely as sightseers and then resigned. To counteract this, some lines now demand that all prospective cadets prove their serious intentions when they apply, requiring that applicants shall have taken preliminary training in a school ship, or at night school, or by other means, as an indication of their desire to follow the sea.



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I know that for ten years I've used an oil that has never caused me a repair bill.

I know that in all these years I haven't had to add oil between regular fillings.

I know that I've run my cars from 50,000 to 60,000 miles, and received good money for them in trade-ins.

And I know a dozen people whose experience has been the same.

Maybe you'll call me hide-bound to stick all these years to Quaker State. But there are things I'd rather experiment with than *my car*. And when my friends can prove to me from *their own experience* that there's a better kind of oil on the market, you'll find me using it.

But I have a conviction that when that day comes, you'll find the name Quaker State on that better kind of oil.

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You'll probably find Sani-Flush in your house. Most women use it to keep toilet bowls clean and sparkling. Sani-Flush is sold by all grocery, drug, and hardware stores—25c. The Hygienic Products Co., Canton, Ohio.

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FOG—A MILLION DOLLAR MENACE

(Continued from page 723)

Thus, early in the nineteenth century London had only two or three fogs a year, whereas in the first quarter of the twentieth century London suffered from an average of nine fogs per year. Since the rise of electrified industry, it has been noted that London's fogs are on the decrease, one reason being that less soot is being discharged into the atmosphere.

Already inventors are attempting to overcome the dangers of fog by adapting discoveries made in other fields. Such an adaptation is employed in the fog camera invented by Captain F. M. Williams. As installed on the "Manhattan," Captain Williams' camera takes pictures through mist and fog on a specially treated infrared ray film. The apparatus can develop and fix negatives in thirty seconds and, according to conditions, it extends the visibility of navigators two to four times.

By pressing a button, the operator can see the picture of a scene only thirty seconds after he opens the lens shutter. Thus, the captain can make a visual record of the ship's progress at frequent intervals.

Another experimenter, William Haight, has erected an electrodrome tower, designed to keep airports and harbor entrances clear of fog. It works on the theory that one can precipitate a drizzle from the air, at least in small quantities, if there is sufficient moisture. But an attempt to dissipate the fog of San Francisco harbor by discharging high-voltage bolts of electricity was unsuccessful, largely because the fog was too dense and widespread.

Professor Alexander McAdie has suggested that the early August morning fogs of New York might be dispersed by electrified sprays from fire boats. Marconi, the radio wizard, also has attacked the fog menace. Using micro radio waves, he has demonstrated that a ship can be guided through the narrow entrance of a harbor without visible landmarks. The location of the vessel is always known from the "radio lighthouses," along the shore. In the Bay of Fundy district, northeastern Maine, the authorities are experimenting with a device which thunders out the name of a place. They plan to locate such fog-horns at strategic points along the coast, and to indicate their position to mariners by the number and duration of the blasts.

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Piston Pins must not fracture until the load exceeds 5 tons.



Model A replacement Pistons withstand a 5-ton crushing pressure.

FROM the beginning, Mr. Ford believed that after he sold an automobile he was obligated to furnish repair parts at the lowest possible price—and to make those parts as good as he knew how. He adopted this policy in 1903. It has been in effect ever since.

The Ford Motor Company still supplies repair parts for the Model T. Thousands of these cars are continuing to give satisfactory operation. Replacement parts are manufactured in quantity for Model A Fords, many of which have passed the 100,000-mile mark.

Parts for these past model Fords are held to the same standard of precision used when these cars were in production. The bars have never been let down on close limits or on quality — frequently quality has been raised.

Recently developed heat-treating processes used for Model A replacement pistons result in better wearing qualities than the original pistons had. Model A valves are now made of a new material which is warp-proof against the higher heat of 1935 engine fuels.

And so it is with V-8 parts — new developments in manufacturing, testing and inspecting are constantly being adopted to insure higher quality and greater uniformity. Regardless of the model you own, Genuine Ford Parts will always prove most satisfactory for your car. They are available everywhere at low price.

You wouldn't buy a car built of makeshift parts. Why gamble with replacement parts in the car you own. Use only Genuine Ford Parts for repairing Ford cars and trucks. Buy where you see the familiar Ford oval.



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e-29

GOING UP!

(Continued from page 693)

overcome before the high-speed lift could become an actuality. It was found that the highest speed to be obtained with alternating current was 400 feet per minute, due to an inherent characteristic of alternating current, but there was no limit to the speed to be coaxed from direct current. So it was necessary to put in converters or motor generator sets where direct current was unavailable.

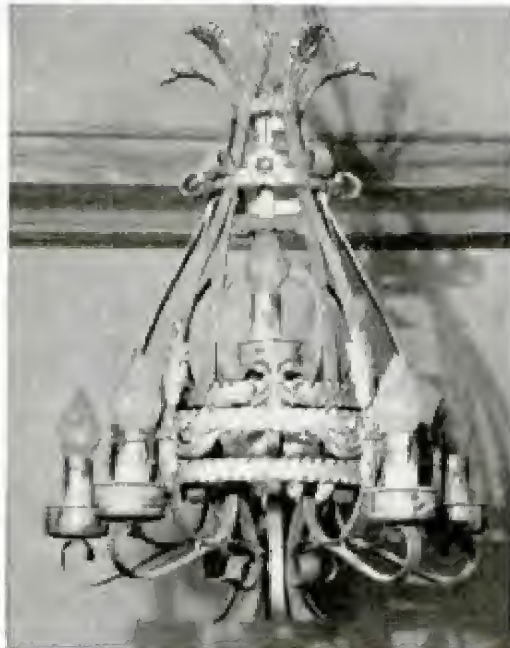
The elevator shaft occupies valuable space and this has resulted in two novel uses of the shaftway. They are the double-decked car and the two cars in one shaft, one express and one local. The double-decker is more practical and the sixty-three-story Cities Service building in New York has eight such lifts, the only ones in the world. Without them the building could not have been economically profitable for more than forty-eight stories.

Elevators have been made so nearly fool-proof that it is unnecessary for the operators to have technical training. At Rockefeller Center the only emphasis is placed on appearance and courtesy when hiring men. They must follow rigid rules in case of accident, however. If the car gets stuck the operator must follow a certain procedure, then call the engineer. Until he receives the engineer's assurance that the car is in running order he is forbidden to touch the controls. All other rules pertain to the handling of passengers.

Not all elevators are built to serve city dwellers. When the dirigible "Akron" was built the workmen had to have easy access to the lofty metal framework. The elevator builders installed two cars which actually went around corners as they followed the sides and top of the tremendous network of metal. Atop the Palmolive building in Chicago, runs the smallest known passenger elevator. The car runs from the roof to the top of the Lindbergh beacon and holds two passengers. It is used by the caretaker for changing carbons and cleaning the reflectors.

Sometimes it is just as important to go down as to go up. In the gold country of Brazil, there is the deepest working mine in the world, 8,000 feet down. There is only one way for the workmen who dig the precious metal to reach it, by elevator—down a mile and a half.

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Mr. Youngberg says: "I did over twenty percent of the work on this chandelier with Nicholson Files, using the Half Round Files and Mill Files for most of the operations. I have always considered them the sharpest, most uniformly high quality files available,— the most useful tools for home craftsmen."

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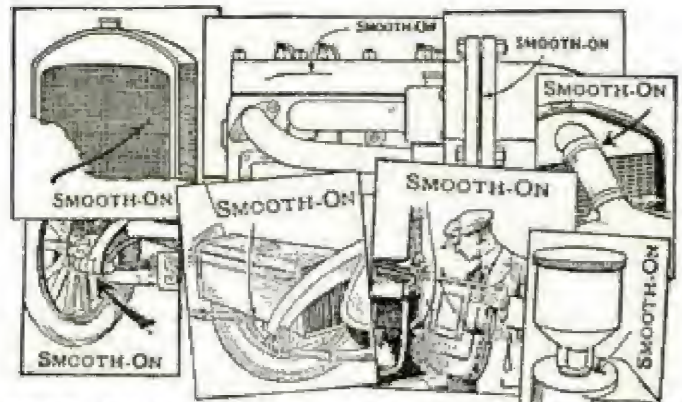
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KEEPING YOUR CAR FIT

(Continued from page 731)

is due to rapid distortion of the drums. The service engineer may check the car's present brake lining with the aid of a special meter and find it is still serviceable, but if the drums are warped, the work is at a standstill until that condition is corrected. With high-speed braking calling for higher brake-shoe pressures it is obvious that the drum is more of a metallurgical than an engineering problem.

Cutting down drums is not always a satisfactory cure for warp because the stock is thinned down and is more subject to distortion. Much warp is due to errors in handling the car, especially setting the hand brake when garaging the car at night following vigorous use of the brakes. The brake shoes then press against the drums as the latter cool and contract. Much trouble is due to failure to realize that with a modern car it is not necessary to release maximum braking power even for an emergency stop. If brakes are used too vigorously axles and wheel spindles may be twisted enough to throw the car out of alinement.

When twists and misalinement are discovered the service engineer calls upon axle presses and alinement equipment to solve the owner's problem. These range all the way from comparatively simple presses for re-arching springs that have flattened out to frame straighteners that twist a whole car back into shape under hydraulic power. One man can operate one of these machines with less effort than he formerly expended struggling with a simple wrench.

TIPS ON BAIT CASTING

(Continued from page 669)

get. Swing the rod directly forward, and as it moves, release the pressure of your thumb a little. The bait, as it travels away from the rod, moves in an arc and then down so most of its speed is lost before it strikes. Try to drop the lure in a natural little splash.

As the bait moves away from the tip of the rod, raise the eyes and follow its flight. Don't let the rod snap all the way forward. Hold it, while the line is running out, at an angle of forty-five degrees. As the bait

(Continued to page 134A)

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2-137 TIPS ON BAIT CASTING

(Continued from page 132A)

is about to enter the water, slow up the whirling spool. Press down gradually with your thumb and completely stop the motion. Just before it is still, bring up the left hand, palm open, and grasp the rod so your fingers hold the reel. The rod is now held mostly in the left hand.

With the right hand grasp the reel crank between the thumb and the first two fingers and, at the same time, bring the rod in closer to your body. But not too close. You must be ready to set that hook at any instant. The instant the bait has entered the water it must be in motion. The only exception is for underwater fishing, where it is allowed to sink, then slowly drawn over the deep holes. By starting the bait at once you take advantage of the first few feet of water and also take up any slack line. As you reel in, hold the hands a little in front of the body so rod and reel can be handled easily. This enables the beginner to strike a fish correctly.

The beginner has a tendency to put too much "throw" in his cast. It isn't necessary to use much if any shoulder movement. Keep the casting arm close to the body. The usual tendency is to start the cast when the rod is pointed too high in the air. Then the lure doesn't keep ahead of the spinning reel and there is a back-lash.

Sometimes the beginner has a tendency to jerk the arm and shoulder with too much snap movement to throw the lure. A good cast is so smooth that it is almost effortless. It is more important to know where the lure is going than to see how far you can cast. Fish have special loafing spots. To get them you must lay a lure where they are. Therefore, the long distance caster and "splasher" who throws a long lure but never knows where it is going to hit, isn't the successful fisherman like the accurate bait caster who knows where fish are.

Practice at a casting club or on the lawn at home. Simply place a target on the grass, stand off thirty feet or less and cast to hit the target with smooth, flowing wrist and arm movements. For this use a regular, hookless casting weight.

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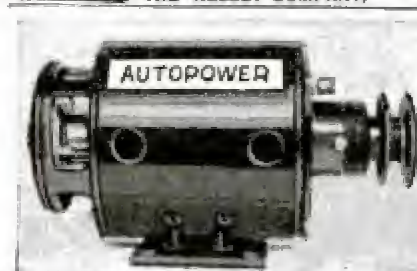


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(Continued from page 644)

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In building your home, however, the next step is to apply bats of mineral wool four inches thick for insulation, then nail the furring strips horizontally to the steel ribs with special cadmium-plated nails with spiral surfaces which twist like screws as they are driven home. Then you follow the same procedure on the under side of the roof.

Now you are ready to attach to the furring strips the interior finish of plywood, plaster board or laths and plaster if you desire a plaster finish. If you have used a concrete slab as a foundation, a waterproof membrane is mopped on, sleepers are attached with concrete nails, and the sub-flooring and finished floors are laid, leaving an air space beneath. Now you're ready for partitions which are attached to the outer walls and faced with the same material used on the side walls. Then come the ceiling joists and the ceiling itself.

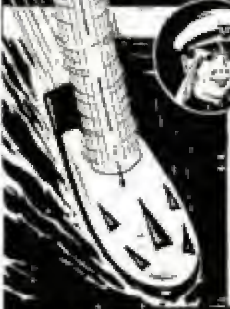
Wiring and plumbing are put in place during the process of erecting, so now you are ready for the interior trim, doors, windows, and the lighting and plumbing fixtures. Decorate the inside, paint the outside and your home is ready to occupy.

You will find the home you have constructed is not a "tin shanty" type of metal building. It is substantial, it is permanent, it is better insulated than most homes constructed of the usual building materials, and it is more than strong enough to withstand the most severe strain it ever will be called on to bear, as evidenced by the insurance policy which offers you protection against structural failure, fire, lightning or wind damage. Termites and other destructive vermin cannot damage your home, the insulation and air spaces make the cost of heating extremely low and an occasional coat of paint is all that will be required in the way of maintenance for many years.

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(Continued to page 138A)

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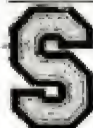
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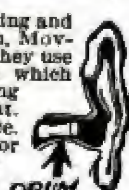
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(Continued from page 136A)

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*S. A. E. Journal.
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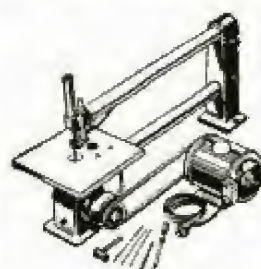
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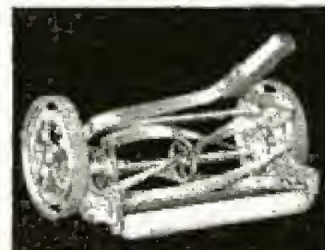
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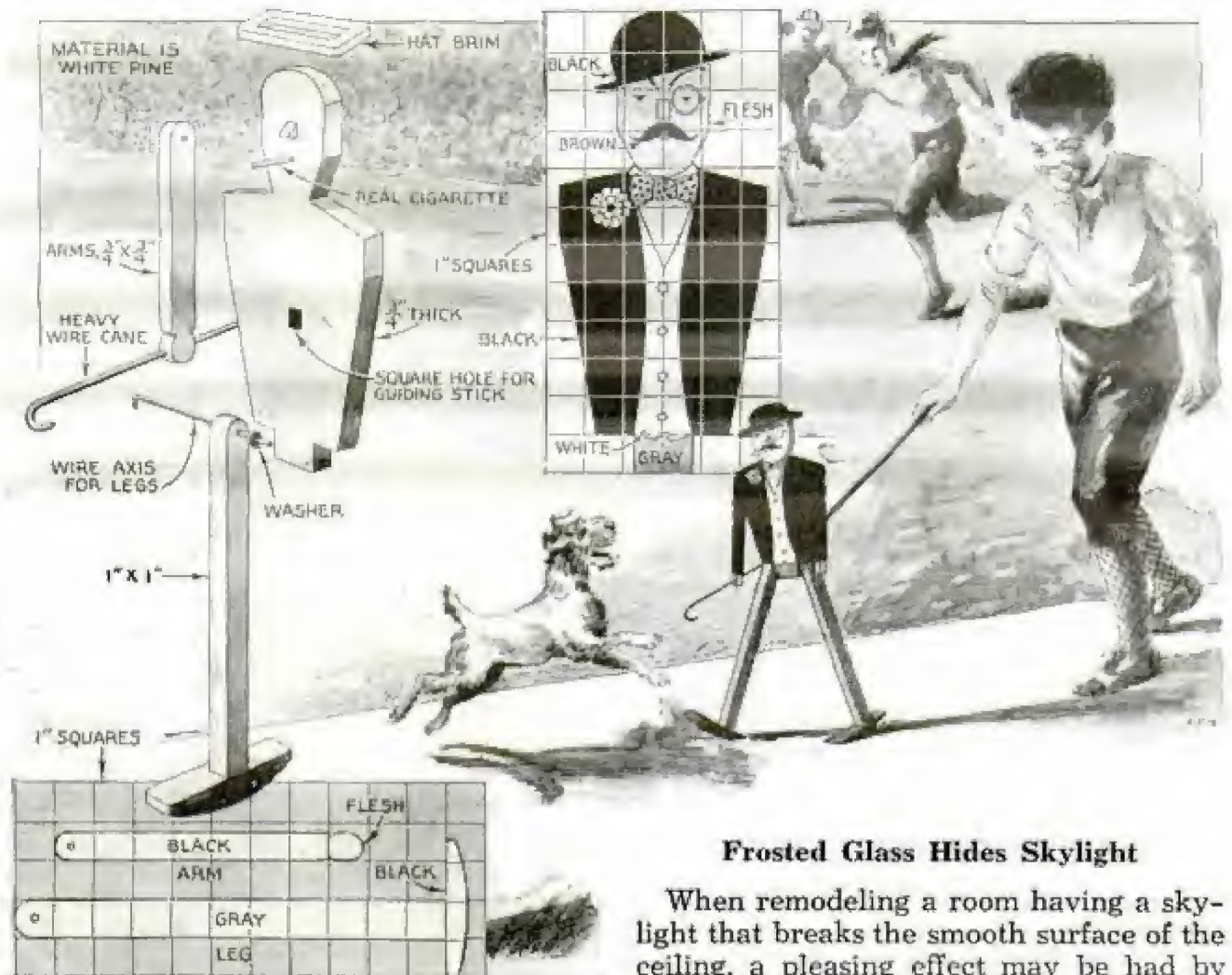
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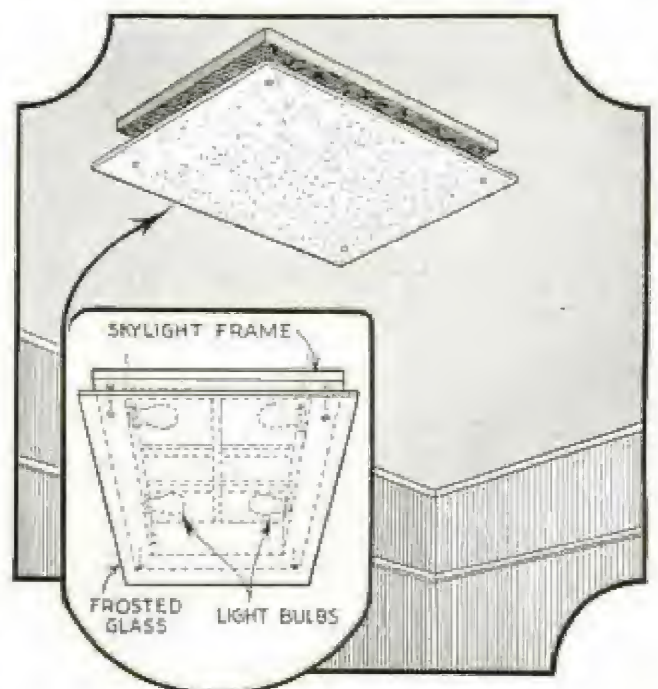
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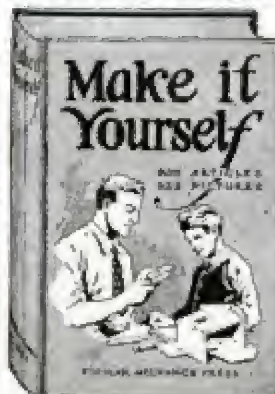
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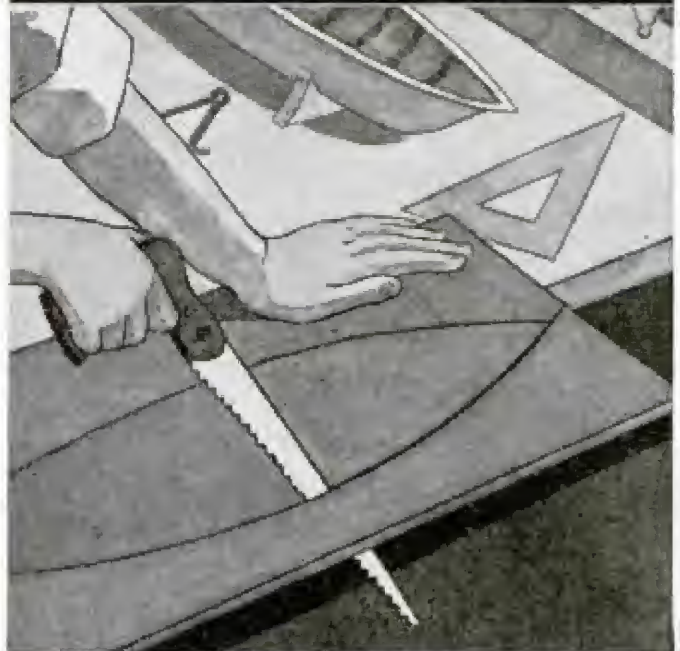
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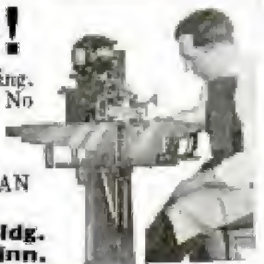
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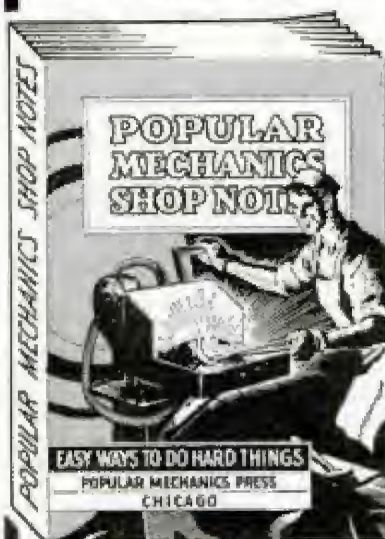
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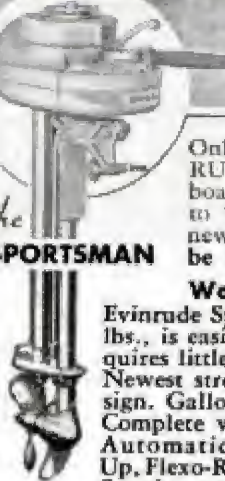
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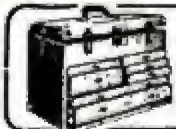


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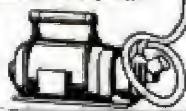
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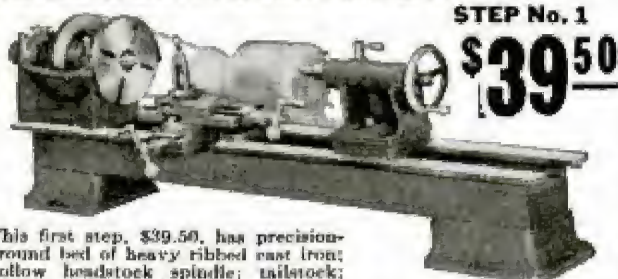
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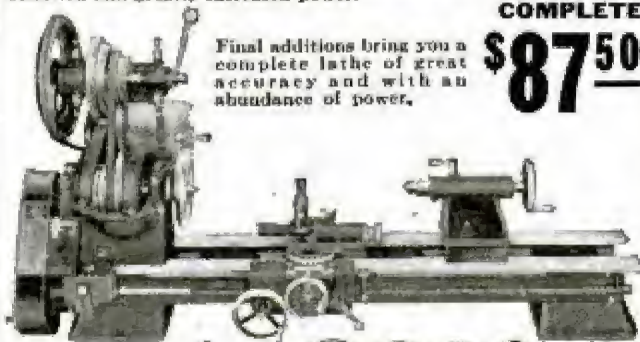
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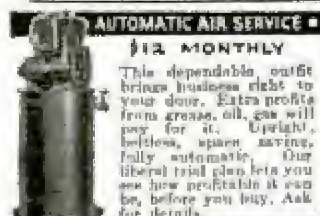
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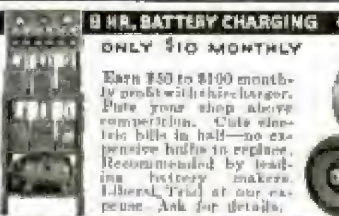
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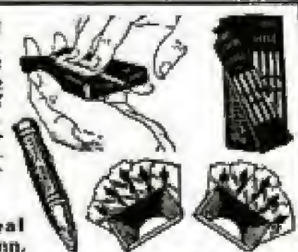
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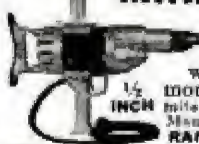
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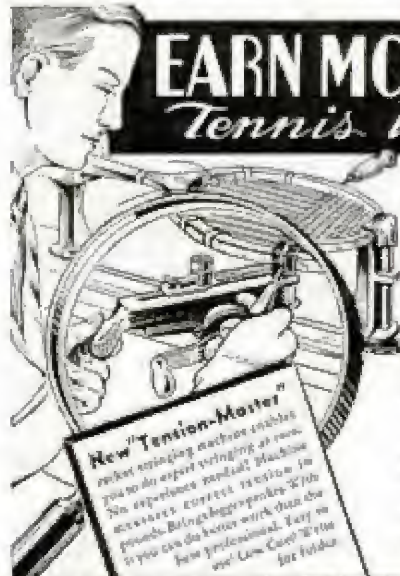
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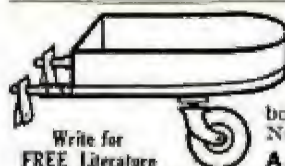
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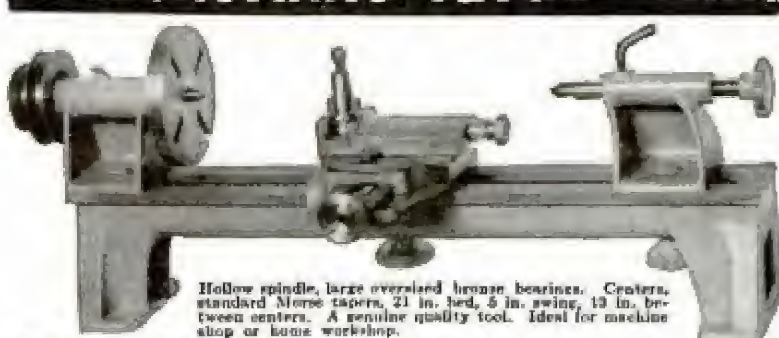
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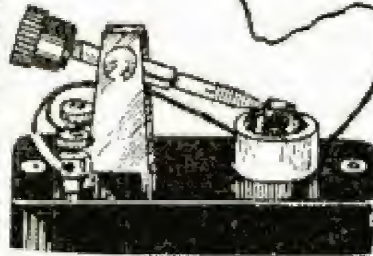
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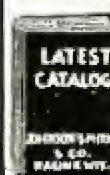
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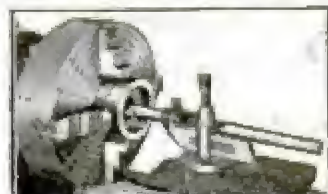
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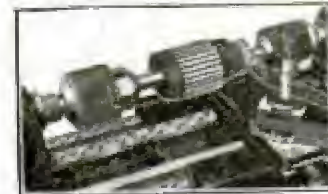
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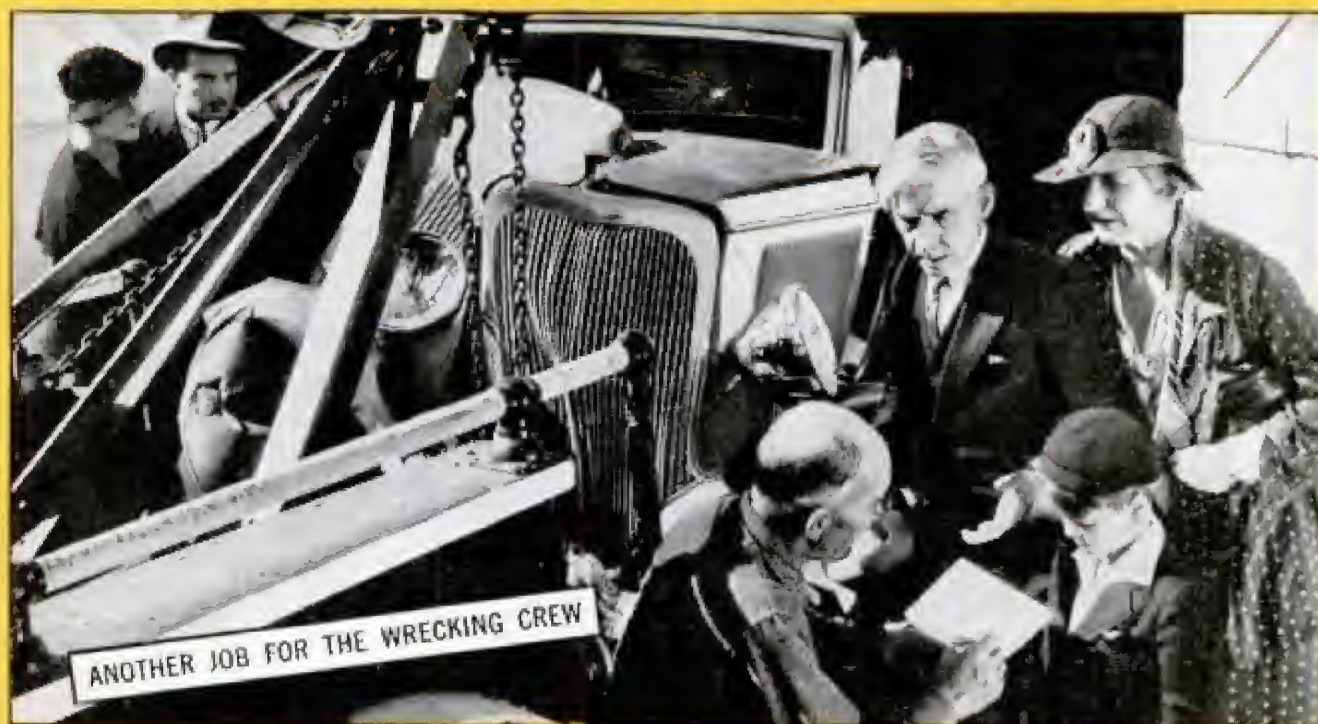
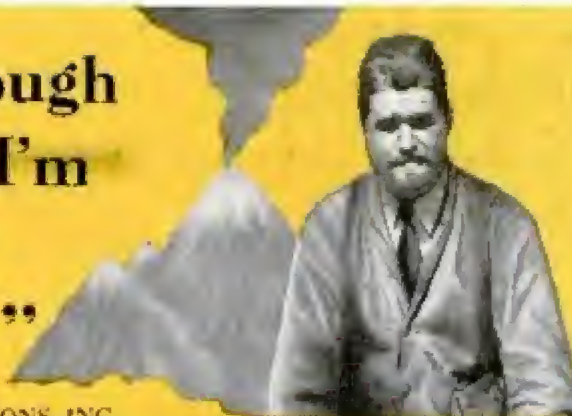
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